THE MEDICAL JOURNAL OF AUSTRALIA

VOL. I.—34TH YEAR. SYDNEY, SATURDAY, JANUARY 25, 1947. No. 4.

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AIR EVACUATION OF CASUALTIES.[1]

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THE high *tempo* of modern warfare has forced great advances both in scientific and in other subjects, most of these being born of necessity. Air evacuation of casualties in this war has rapidly advanced in technique. Today the movement of vast numbers of patients by air is accepted as a routine procedure, and is, or should be, incorporated in the planning of every military campaign.

HISTORY.

Military evacuation was first carried out in 1919 by both British and French aircraft of the standard military type being used. Some years later, in 1928, the Flying Doctor organization was developed in this country; but patients had been flown by air as early as 1922.

Military medical air evacuation was first tried on a moderately large scale by the Russians in the Russo-Finnish war. Chest casualties were flown to the specially equipped hospital on the shores of Lake Ladoga, where teams of the best chest surgeons of the country were grouped. The speed of the journey enabled many casualties to reach hospital who in previous wars would have died on the battle field. Because of air evacuation, the percentage of survivals from these wounds reached an all-time high record, approximately 80% of recoveries being recorded as against 50%, which was the survival rate for England and France in the first World War.

In the second World War the Germans commenced air evacuation of casualties in large numbers when they attacked Poland in 1939. Casualties were on the operating table in base hospitals in Germany within two hours of being wounded in the centre of Poland.

The Royal Australian Air Force had two aerial ambulance units, the first in the Middle East and the second in Australia. The aeroplanes used by these units were purely for medical use, of a limited number and obsolete type.

The first large-scale air evacuation of patients did not occur until the New Guinea campaign. When the Japanese army was finally stopped in its southern advance near Moresby and pushed back over the Owen Stanley Ranges to Dobodura and Buna, the number of aircraft available to help was very small; everything that could fly was rushed forward to try to cope with the job of onward transportation of urgent freight. Special Red Cross aircraft purely for medical use to cope with the evacuation of overwhelming numbers of wounded were therefore unprocurable, so ordinary transport aircraft were utilized for back loading of these casualties. Patients who were in the thick of the fight at Buna found themselves in base hospitals at Moresby, sometimes within two hours of being wounded. It occurred on several occasions that a transport bearing troops forward returned half an hour later with some of these identical troops as battle casualties. The strips, being utilized as soon as they were captured, were so far forward that fighting was still going on in the circuit area of the aircraft as they came in to land. The alternative method of travel was by the Kokoda trail—a journey of weeks on the shoulders of stretcher-bearers. This sudden introduction of air evacuation was born of necessity, owing to the unspeakably rigorous land journey and the enemy possession of the sea coast; it caught the Australian and United States medical services unprepared, as no trained medical personnel or organization for caring for patients on aircraft was available.

Early Errors in Organization.

A review of the air evacuation in this campaign showed the following failings (these would naturally be expected

[1] Read at the Combined Services Medical Conference in July, 1945, at Sydney.

with such an impromptu organization). First, both army and air force medical officers at that time did not realize what was happening in the air. It was only on rare occasions that an officer was present at the loading of patients to instruct the pilot what to expect with seriously wounded casualties. One pilot stated that in 200 trips he carried a medical attendant only twice. This led to innumerable instances in which the transport crew had to attend to casualties in the air—for example, giving morphine to chest casualties who were carried lying down flat, the morphine being obtained from the emergency crash kit of the plane. In those times no medical kit or oxygen was ever carried for these casualties who were often taken to a height of 12,000 to 15,000 feet to cross the ranges.

Secondly, patients were often loaded into the aircraft drenched to the skin after a tropical downpour—their clothes consisted only of their shirt and trousers. Temperature drops 2° C. per 1,000 feet, and when the aircraft rose from the heat of ground level to the cold at altitude, the patients rapidly froze. There were not sufficient blankets to supply more than one to stretcher patients, and more often than not these also went without. Aircraft at this period had no means whereby the interior could be warmed, as is the case in more recent types.

Thirdly, patients were loaded improperly prepared for flight; one such example is the patient with a bullet wound through the leg above the knee, received five days prior to evacuation. All he had for support of the joint was a cotton bandage. In the bumpy air he suffered agony, arriving at his destination in poor shape. A plaster slab or a splint would have given great relief. Again, there is the case of the psychotic patient who wandered up to the front of the transport, grabbed the pilot's loaded revolver and threatened him with it. Fortunately his attention was distracted by the cries of a badly wounded man. He immediately went and commenced fighting with this patient, thereby lessening the latter's chance of survival.

Finally, on many occasions, thoughtless pilots, not knowing any better, indulged in elaborate "peel offs" whilst carrying a full load of patients when they reached the other side of the range. This should never occur unless as evasive tactics against enemy aircraft. The rate of ascent and descent should never exceed 275 feet per minute. Owing to lack of coordination between the transport and movements section and the medical section, transports were often held up on forward strips waiting for patients, thereby running the risk of enemy "straffing" attacks.

ORGANIZED EVACUATION.

It was soon after this campaign that the 804th United States Medical Air Evacuation Transport Squadron arrived. Squadrons of this type were conceived by General Grant, the air surgeon of the United States Army Air Force, and were designed for bulk movement of casualties on transport aircraft. Orders were given by General Kenny that air evacuation of casualties was the responsibility of the air force, and when they were available air evacuation was to be under the control of these medical air evacuation squadrons. The 804th Squadron, composed of five doctors, 25 sisters and 25 orderlies, along with necessary maintenance personnel, were soon in full control of all New Guinea medical air evacuation. At this time the Australian Seventh Division was fighting its airborne campaign up the Markham Valley, and the Ninth Division was progressing along the coast past Lae and finally took Finschhafen.

Organization of Australian Air Evacuation.

Air evacuation of wounded became too big for the one available squadron to cope with, so assistance was asked from the Royal Australian Air Force Medical Services. A medical officer with twelve orderlies was posted to the 804th Squadron to help with the situation.

Wounded were at one time being evacuated at the rate of about 125 a day from each division to the advanced base hospitals at Dobodura and Moresby. The day after the first transport landed on the newly prepared strip at Finschhafen, the congested Ninth Division hospitals were relieved of 478 patients. They were moved in one morning from Finschhafen to Moresby, medical attendants of the air evacuation squadron being on each of the aircraft, which numbered 25. Fighter escort was provided in these early days.

After working for two months with the Americans, the medical officer reported to Royal Australian Air Force Headquarters, and it was decided to form the Royal Australian Air Force Number 1 Medical Air Evacuation Transport Unit, which was half the size of the American unit. It came into existence in March, 1944. The sisters and orderlies were put through a comprehensive training course in Melbourne, and finally the unit became operational in July, 1944, working in conjunction with the American 804th Squadron on evacuation at Nadzab in New Guinea.

Since this much has been achieved. All the Australian air evacuation of First Army, both in forward areas and from operational areas to the Australian mainland, has been done by this unit, which is still operating in that capacity at Lae. After September, when the 804th Squadron moved on with the American army to the Philippines, Number 1 Medical Air Evacuation Transport Unit was responsible for all air evacuations in New Guinea, both American and Australian. At one time when the American Army Transport Corps air evacuation unit was short of personnel for their trans-Pacific evacuation to America, four of the big "C54" aircraft were staffed by members of the Australian unit.

Number 1 Medical Air Evacuation Transport Unit has carried more than 14,000 casualties in the period of its existence without a single casualty, over 2,000,000 miles having been covered by personnel in their duties.

Policy and Functions.

The policy is to use transport aircraft which are carrying troops, supplies, munitions *et cetera* to the forward fighting areas, and back load with patients the aircraft which more often than not would have returned to base empty. A flight team consisting of one sister and one medical orderly flies forward with the supplies, and then cares for the patients on the return journey.

The medical evacuation units classify the air evacuees and superintend the loading of the aircraft (usually "C47" Douglas aircraft in this theatre of war), care for evacuees during flight, and superintend the unloading. The services requiring evacuation are responsible for collecting their patients and for providing shelter and medical attention at the points of emplaning and deplaning. This was done efficiently at Nadzab; the army built a 200 bed strip-side hospital purely for staging patients in and out of the area. The Medical Air Evacuation Transport Unit of the Royal Australian Air Force provides the necessary personnel and equipment for the proper medical care of patients in flight, and functions as the coordinating agency between the service requiring evacuation and the service supplying the transport aircraft. The final decision as to the suitability of patients for air evacuation is the prerogative of the air evacuation unit. There are two Royal Australian Air Force air evacuation full-strength units in forward areas, one being at Lae, which is carrying out all the air evacuations of the First Army, and one at Morotai, which is carrying out those of the First Australian Corps, as well as all Royal Australian Air Force and naval evacuations.

These units have sergeants out on detachment to all the main fighting areas, such as Aitape, New Britain, Bougainville and Madang in the First Army theatre of war, and at all the places where the Australian army has landed in and round Borneo—for example, Tarakan, Brunei, Balikpapen, Tawi Tawi *et cetera*. These sergeants go in at all landings just prior to the strip's becoming serviceable, and carry out all the liaison work with the army medical services. When evacuation commences, their routine is as follows.

The night before, they send signals to the parent unit stating the number of casualties, lying and walking, awaiting evacuation. The orderly room at the parent unit

then arranges with the transport squadron what aircraft will be allotted to bring back these patients, and signals the answer back to the sergeant. The hospital arranges that the patients are down at the strip awaiting loading at the correct time. The sister and orderly with their medical equipment fly forward with the plane to collect the patients. The pilot radios the estimated time of arrival when one hour distant; the hospital then takes the patients down to the strip in time. This avoids keeping sick men waiting in ambulances in the blazing sun of the tropics. The nominal rolls and X-ray films (also the medical documents of any mental casualties) are handed over to the sister. The rest of the patients have their field medical cards attached to their shirts. With these nominal rolls as a guide, the sister checks over all patients in the ambulances, observing their condition, seeing to the restraint of psychotic casualties and ascertaining that the previous giving of sedatives is marked on the medical cards *et cetera*. Having seen the patients, she then proceeds to load them in the desired positions. Meanwhile the medical orderly has been fitting up the transport ready to receive the stretchers. When the transport is loaded, the sister gives the pilot instructions appropriate to the casualties carried. On "take off", the sister and orderly reassure all patients who have not previously flown, and watch litter patients just to make sure that the litters do not slip. The sister then has to make out her flight forms from the nominal roll, including the clinical sheet on which she has to mark down all reactions of patients to flight and the treatment she has given, also all preflight sedation and any relevant point of interest in the history of the casualty. Pulse and respiration rates of all casualties are recorded, and the temperature when necessary.

It must be remembered that in this theatre of war the evacuations are of many hours' or even days' duration, as against an evacuation time varying from minutes to a few hours in the European theatre of war. In the latter, Women's Auxiliary Air Force personnel were utilized. Out here, in view of the long distances and rugged flying terrain covered, sisters and well-trained medical orderlies were considered necessary, as the trips are equivalent to a day or more spent in hospital. These flight teams have amply justified their selection.

Fluids and nourishment are given during flight and any medical attention required—and it is surprising how much attention is required on these journeys.

When about half an hour out from the point of deplaning, the pilot is again asked to signal in to the home duty pilot tower, telling of imminent arrival with patients, stating the number of ambulances that will be required.

The forms are made out in duplicate to allow the army hospitals to know how the patients have reacted during the flight and the treatment given. One copy of each form, along with the nominal rolls, X-ray films and medical documents, is given to the responsible army authority with the ambulances. The transport is unloaded under the supervision of the medical orderly and sister. The sister and orderly return to the unit, where they check in with the operations clerk. The forms are examined by the medical officer, who discusses cases and treatment with the sister, and finally the clerk receives them for statistical use. The medical kits are replenished, and with the oxygen and plasma set are put away.

The foregoing is the routine for a forward evacuation. For a mainland evacuation, the sister can go around the night before to check over her casualties and decide her loading programme at leisure. A special loading list form is made out in duplicate. One is left at the field ambulance of the hospital from which the patients are being evacuated, the other is held by the sister. The ambulances are loaded in the order in which patients have to enter them, and this eliminates confusion. Copies of these forms can be seen if desired. The medical orderly is responsible for checking the aircraft which is to be used, and seeing that all the brackets or webbings are in working order. These things all help towards a smooth loading and an early "take off".

The personnel of Number 1 and Number 2 Medical Air Evacuation Transport Units do not go further south than Townsville, where a third medical air evacuation section is set up. The flight teams are changed here, the personnel of the third air evacuation section taking over and delivering their casualties at Brisbane or even further south in special cases.

The Red Cross, the Australian Comforts Fund and the Salvation Army have establishments on the strip at every stopping place, and have done particularly fine work in helping to feed and care for the casualties.

Aircraft.

In air evacuation of casualties, transport aircraft of many types have been used. Water planes such as the Sunderlands, Catalinas and Martin Mariners have carried out the evacuation from islands newly taken, and before the strips have been repaired or built—for example, at Jaquinot Bay in New Britain and at Tarakan. "C54", the four-engined Douglas Skymaster, is used for the trans-Pacific flights.

The main aircraft in use, however, is the two-engined transport Douglas "C47"; this carries out more than 90% of the medical evacuation in this area. The earlier types

FIGURE I.
Showing interior of Douglas "C47" aircraft fitted for ambulance purposes.

of aircraft are fitted with metal brackets, eighteen stretcher casualties being the full load. Later types, however, have the webbing fittings which enable 24 litter casualties to be carried when the correct American stretchers are used and nineteen if British or Australian stretchers are used.

The latest types are fitted with oxygen equipment, which enables oxygen to be given throughout the aircraft. This is now being utilized in the evacuations from Morotai, between Biak Island and Merauke, where patients have had to be carried at a height of over 19,000 feet on occasions. (See Figures I, II and III.)

Selection of Cases.

If there is an adequate number of aircraft, all casualties can be evacuated; but when there is a limited number, or when more than one hospital of various services request evacuation, there must be some method of priority of casualties. Those most urgently needing evacuation are chosen. This is the job of the medical officers of air evacuation units. Of course, if there is only one hospital in the area, it can decide its own priorities.

Let us now discuss in more detail the loading of aircraft. Stretcher casualties in proportion to walking casualties approximate one in three, although if an extremely long trip is to be undertaken, it is as well for all to be stretcher casualties. These casualties are always loaded head foremost at the front end, because this is the centre of balance

of the aircraft, and bumps are far less noticeable than they are in the tail. The heating system is also much more efficient in the front end of the aircraft. Those stretcher casualties who are likely to need the most nursing attention are placed on the lower bunks so as to be more readily accessible and to allow more room for gravity to take effect whilst blood or plasma is being given. Even when all stretchers are in position, any one can be removed without disturbing the others.

Stretcher casualties with fractures or wounds should always be placed so that they have the wounded limb to the centre of the transport, so as to facilitate any necessary treatment. Fracture casualties usually travel well and can be placed on the top litter, provided that the support is not so unwieldy as to make a fit impossible.

It is often more comfortable to suspend fractured limbs from the litter above. A check must be made of the following points prior to departure: (i) that all wounds and fractures have been adequately supported and all the wounds recently dressed; (ii) that patients with pulmonary tuberculosis have masks on, and psychotic patients

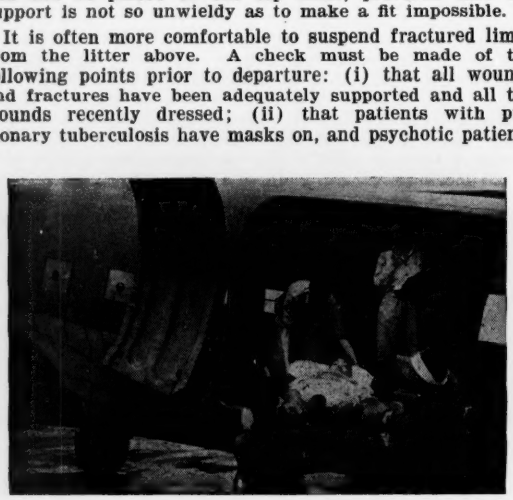

FIGURE II.
Loading Japanese prisoners of war.

have been properly sedated and restrained; (iii) that all patients have recently passed urine and emptied their bowels, and that those needing catheterization have been attended to; (iv) finally, that a light meal with adequate fluid has been taken.

The importance of the thorough checking of all patients prior to departure was demonstrated in the carriage of a patient with a diagnosis of prolapsed brain and skull injury. The forward clearing hospital had completely missed the fact that he had also five bullet holes through his abdomen. The fact that he was a Japanese was no excuse for such negligence. Another listed as a skin casualty was found to have undergone an appendicectomy the day before.

Chest casualties must be loaded forward on the bottom stretcher in the semi-Fowler's position, so that the bulkhead of the aircraft may be used as a bolster against which to stack the pillows. The litter second from the bottom can be left out so as to make room. Some medical officers prefer loading chest casualties at the tail of the aircraft, the reason being that air is sucked out at the front end of the cabin, but blows in towards the tail; they hold that by this method chest casualties have a good supply of fresh air. All stretcher casualties must have three blankets and all walking casualties at least one blanket, as when heights of 19,000 feet are reached the cold is intense. The aircraft heating system fails to function at this height. An interesting point is that when oxygen is given to patients they say that it warms their extremities (increased metabolism probably).

It is well established that early morning flying is by far the smoothest, so stretcher casualties likely to be upset by bumpy weather are sent off on these early flights. The walking casualties can be sent on later in the day. Flight near the ground is usually bumpy because of air currents—a high flight is usually smooth. Therefore the sister should always indicate to the pilot whether she needs a high, smooth trip, such as is required for patients with recent fractures, kidney stone with renal colic *et cetera*, or a low if slightly rougher trip for chest casualties and those with severe anæmia and cardiac or brain disorders *et cetera*. When several loads have to be evacuated from the one place, the medical officer should arrange his loads so that casualties who travel better at a low level are not mixed with those who travel better at a higher altitude. Patients with *otitis media* travel well provided the ascent and the descent are gradual.

The sister should advise the pilot to turn back if she thinks the altitude is too great for her patients. In emergency, as in sudden collapse of a patient, she should seek the nearest landing strip, and have a signal sent advising arrival and requesting the presence of a medical officer. A sister should never tell a pilot to fly low, but to fly between definite altitudes; otherwise she will be horrified more often than not to notice that the pilot is revelling in the opportunity of flying at "0" feet. It is the sister's duty to keep a check on the altitude at all times and chart it on her form.

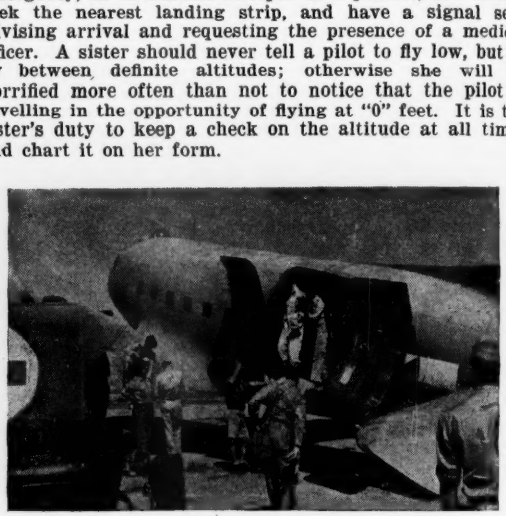

FIGURE III.
Unloading walking wounded.

Medical Kit.

An extremely comprehensive medical kit is carried by the flight team. A plasma set is essential. On the few occasions this has been used in the air it has been a life-saver. The kit contains hypodermic syringes (ten and two millilitres) used in the administration of penicillin and of "Sodium Amytal" intravenously, and numerous other things, such as rectal tubes, pans, bottles, "Thermos" flasks, catheters *et cetera*. Oxygen equipment is always carried, various types being used. This is a really essential piece of apparatus and has saved lives on numerous occasions. The system most favoured till now has been a low-pressure 1,150 litre bottle at 500 pounds' pressure with a pressure indicator and a flowmeter measured in litres per minute up to six. The face mask used was a "BLB" type with the rebreathing bag.

Each member of the crew in forward areas has to wear full tropical equipment and carry a full water bottle, flying rations, jungle kit and steel helmet. The orderlies carry revolvers, as much of the flying is done over enemy occupied territory. "Mae Wests" must be carried on all flights over water. Flight crews in forward areas are "briefed" every fortnight on the tactical situation, forward enemy positions *et cetera*, and on the escape routes to our lines. This is done by the army liaison officer. Crews who regularly fly over Japanese occupied territory—for example, round the Wewak area—then have some chance of evading capture if forced down.

Crash Landing.

In the event of a crash landing, the following procedure has been adopted and has proved satisfactory in practice several times. A Douglas "C47", provided it has enough altitude, can fly for a time on one engine. The medical orderly and sister, on the order "prepare for crash landing", organize as follows in a calm reassuring manner, giving

orders clearly. All loose gear, baggage, medical kit *et cetera* is thrown overboard, except that some selected medical drugs may be saved if time permits; it is always borne in mind that there is a comprehensive medical kit in the rubber dinghy equipment. Both over land and over water the door should be dumped, as it has been found by experience that the formerly feared "flooding of the rear compartment" does not occur if a skilful landing has been executed. The weight of the aircraft's engines forward raises the rear compartment clear of the water. Thus the danger of the door jamming owing to warping of the framework of the aircraft on striking the water does not arise.

If there is time, all stretcher casualties should be turned round so that their feet and not their heads are towards the direction in which the aircraft is travelling. The restraint straps are applied under the arms and across the body, and instructions are given to hold on tightly. The sister then goes with the navigator or second pilot into the lavatory compartment; they place their backs against the bulkheads on either side of the door. The latter will be left open to prevent jamming. The hands are placed behind the neck to give additional support. Just prior to "touch down", the medical orderly and wireless operator take up positions with their backs against the forward bulkheads, never against the door, which will fly open on impact. The first pilot retains his position. If the aircraft is coming down on water, "Mae Wests" must be put on, but not inflated until it has come to rest, as the rubber type tends to burst. When the aircraft has come to rest, the navigator or second pilot and sister immediately inflate dinghies on the water. The sister than enters one and superintends its loading, placing the most serious casualties in the one occupied by herself. Walking casualties file out so as to be out of the way of the unloading of the stretcher casualties, which is being carried out by the medical orderly and wireless operator, the first pilot helping if he is able. Stretchers are left behind unless absolutely necessary.

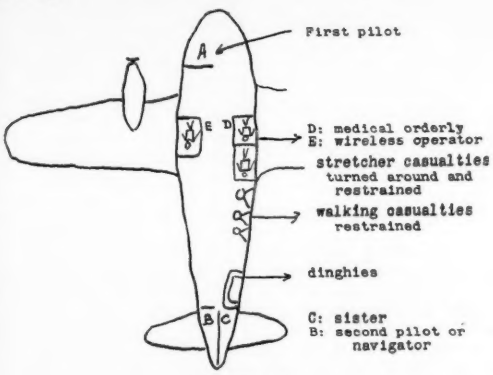

FIGURE IV.

CLINICAL OBSERVATIONS.

When air evacuation was first planned, it was thought that there were all sorts of conditions which would make impossible evacuation of the patients by air.

This hypothesis has been completely confounded, and it has been a constant source of surprise how little reaction there is to flight in really serious conditions provided adequate attention is given to treatment by trained flight personnel.

In this theatre of war with our aerial superiority we have not the urgency of evacuation which would otherwise be the case. Our front-line hospitals are well established and are relatively immune from bombing. Seriously wounded men can therefore be held till they have gone some distance on the road to recovery, and thus they stand up well to air evacuation. It has therefore not often occurred that casualties requiring transfusion of plasma or other drastic treatment have been carried, this being in direct contrast to the urgency of evacuation during the Buna campaign, during which conditions were not so predominantly in our favour.

The only really urgent casualties that have been evacuated are those with eye injuries or brain injuries and those requiring plastic surgery, all of whom were evacuated for urgent attention at special clinics in the big hospitals on the mainland.

The casualties who have caused most trouble in flight are psychotic patients, early traumatic casualties who were still suffering from shock, chest, heart and head casualties and patients with scrub typhus.

Psychiatric Casualties.

Of all casualties evacuated in New Guinea, it is an alarming fact that 15% are psychiatric. Air evacuation of such casualties is ideal, provided proper care is taken, and many of the statements now made are in support of the findings listed by Captain Boileau, of the 804th Air Evacuation Squadron, with whom we were associated. Thousands of these casualties have been carried now. They are divided into three classes: "serious mental litter", "mild mental litter" and "mild mental walker". The classification is based on the diagnosis submitted on the manifest by the hospitals, and it should be considered that prolonged study of these cases is not possible in forward areas. Throughout the records are found frequent notations made by the flight nurses, as follows: "physical condition poor", "marked dehydration", "state of exhaustion".

Owing to conditions of active service in tropical areas, these casualties frequently pass unnoticed in their unit until they have reached a fairly advanced stage, when their physical condition deteriorates, and many of them arrive at the hospitals in a state of malnutrition, dehydration and physical exhaustion. Because of the problems involved in the care of such patients, advanced hospitals are forced to evacuate them as soon as possible, and the patients arrive for evacuation in poor condition to withstand the stress of travel.

It has been found that when conditions permit of a course of treatment, as, for example, with "Cardiazol", casualties travel infinitely better. This was proved at Lae, where Captain Ross gave a course of treatment to casualties who had been evacuated from the fighting area. On many occasions flight nurses travelled with serious psychiatric casualties from forward areas, who reacted unfavourably to flight, having been poorly prepared by the hospitals concerned. Some weeks later the same nurses then evacuated the same casualties, after treatment at Lae, to the mainland. All commented on how well the casualties now travelled.

Many casualties are wrongly cassified as "serious mental litters", and after having been released from restraint by the flight nurse, sit up like any normal person. Many patients are over-sedated, many of the more mildly affected needing no sedation. The opposite has also frequently occurred, the restraint of walking casualties who became violent on commencing flight being a common occurrence. An interesting point has been noted, that often a misbehaving mental casualty has responded to orders given by a fellow psychotic when all requests for cooperation by the sister and orderly had been unavailing.

Adequate preparation of a psychotic for flight is essential. The drug of choice for sedation is "Sodium Amytal". Violent patients need a large dose, and any hospital that has been treating a casualty for some days should be in a position to estimate what is required in preparation for flight. The dosage varies with the individual casualty, depending to a large extent on the physical condition and state of excitement. "Sodium Amytal" administered intravenously just before the casualty is loaded onto the ambulance is the ideal treatment, as it produces a quick result and can be better controlled. A psychotic should never be so deeply sedated that he cannot be roused. Any further sedation *en route* was usually by the oral administration of "Sodium Amytal" or "Nembutal" in small doses when necessary.

In one-third of the cases it was necessary, because of the disturbed condition of the patient, to give further

sedation. When such resistance is met, the intravenous administration of "Sodium Amytal" is the only answer. Morphine should never be given, either as pre-flight sedation or in the air, as it has been found that in severe cases the amounts required to have the desired effect are so inhibitory to the respiratory centre as to be dangerous.

Paraldehyde is useful as a sedative if given rectally. When it is given orally, the result is deplorable to all concerned if the patient should be air-sick soon after "take off". Patients who refuse sedation in the air can make it impossible to give this drug rectally, whilst the intramuscular injection is not favoured, although good results have been obtained by the use of this method of administration of paraldehyde combined with "Sodium Amytal". Some casualties can absorb a terrific amount of sedation. I have seen a patient lying on the strip in preparation for evacuation in a raving, struggling condition half an hour after the administration of 28 grains of "Sodium Amytal". I need not mention that he was of extremely strong physique. "Evipan Sodium" is not recommended. Patients when quiet should never be disturbed, as they commence to struggle, thus inducing dehydration and exhaustion. This is the type of patient who usually refuses sedation and gives the greatest trouble. Therefore, whilst patients are waiting for loading on the strip, nobody should be allowed to approach, converse with, or stand round them.

Dehydration.

In this theatre of war, where the least exertion produces copious sweating, dehydration should be avoided at all costs, especially in psychotic cases. Temperatures up to 150° F. have been registered in a Douglas aircraft which has been standing for an hour on the strip at midday. Because of this, casualties should be loaded just prior to "take off", and if there is a break in the journey they should be removed and placed in the shade cast by the wing of the plane during the waiting period.

In preparation of the psychotic for flight, therefore, it is necessary to ensure that copious fluids are first taken. These must be given intravenously if necessary, just prior to "take off".

The use of tight clothing, blankets *et cetera* as restraints should be avoided; the strait-jacket is not advised.

An illustration of the foregoing points was given by a flight nurse who against her better judgement accepted a poorly prepared casualty.

The patient was wakened at 1 a.m., and without food or drink was brought to the strip for 5 o'clock "take off". He was restrained in such a manner by rope that it had frayed right through his pyjama coat and broken the skin underneath. There was a smell of paraldehyde about him, but on examining the patient's documents the flight nurse discovered that there was a blank sheet for his last three days in hospital. As he was struggling violently, she surmised that the sedation was insufficient, and gave six grains of "Sodium Amytal". He was an emaciated type of individual. The hospital sedation had evidently not acted when he was loaded into the transport, with the result that one hour out from the base the patient collapsed and could not be roused. His breathing was extremely shallow and he had a cyanotic tinge, rapid, thready pulse and clammy skin. He recovered somewhat with reduction of altitude and restoratives, but his condition was far from satisfactory on arrival.

Such poor preparation of a patient is only too frequent in some of the forward areas. That is the reason why many flight nurses refuse patients who, as they know by bitter experience, will react poorly to flight.

Medical documents should on no account be given to mental patients, as all of them invariably try to read them; medical officers' comments would not always be helpful for the patients' well-being.

If a long journey is to be undertaken, all psychotics should be provided with the means of restraint, as some types start to deteriorate mentally after seven or eight hours of flight. On the other hand, many of them improve as they go further south. The latter, however, are usually the more mildly affected.

Recently, on an experimental flight, I flew with a load of psychotic casualties from Lae in New Guinea to Melbourne, a distance of 2,300 odd miles, all in one day, in a "C47" Douglas. This was done to note the reaction of the patients to such a long journey (nineteen hours). As far as Brisbane it was noticed that most of the casualties were cooperative, but as we progressed further south, they became more and more irritable, irrational and quarrelsome. Six of them were from New South Wales and taken off at Sydney, and unfortunately some passengers were taken on whose conduct further upset the patients.

This brings out two points: (i) that ten hours' flight in one day is enough for a mental case, and (ii) it is better to wait for a load of patients than to carry outside passengers, as this procedure only leads to difficulties for the flight nurse and upsets the patients and their treatment.

Restraint of Psychotic Patients.

The method of restraint for a maniacal casualty is as follows. Restraint straps should be of soft material, such as triangular bandages or towels, as it has been found that the use of canvas or rope causes abrasions through the friction caused by the struggles of the patient. Ordinary cotton bandages, even though of many thicknesses, after continual struggling, tend to become rolled and thus injure the skin.

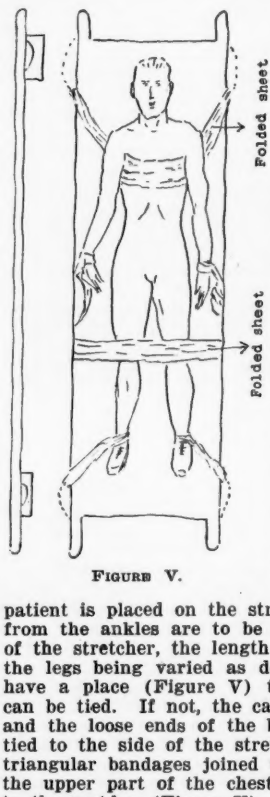

FIGURE V.

The method of application of restraining bandages to an acutely psychotic patient is as follows: (i) The bandage is folded to the width of a small arm sling as in *A* of Figure VI. (ii) Strips of adhesive tape about one inch wide and fourteen inches long are then wound round, as in *B* of Figure VI, sufficient room being allowed in the loop to permit free circulation and at the same time prevent the patient from working the limb loose. (iii) After the tape has been wound around about three times, as in *B* of Figure VI, the end of the tape is taken through the loop (between limb and binding) and brought out through the loose ends of the bandage, as in *C* of Figure VI, and then the binding is continued as before (in *B*). (iv) When the patient is placed on the stretcher, loose ends of bandage from the ankles are to be tied to the adjacent rest-legs of the stretcher, the length of freedom of movement for the legs being varied as desired. (v) Some stretchers have a place (Figure V) to which the hand restraints can be tied. If not, the canvas is slit about two inches and the loose ends of the bandages from the wrists are tied to the side of the stretcher. (vi) A sheet (or two triangular bandages joined together) is then placed over the upper part of the chest under the armpits and tied to the rest-leg (Figure V). This prevents the psychotic patient from butting the patient above. (vii) If necessary, a folded sheet can be tied across the patient's thighs; thus excessive knee action to the discomfort of the patient above can be prevented.

It is important that patients should not be wrapped in tight clothing, blankets *et cetera*, owing to the danger of excessive dehydration. In all cases it is desirable that the patient shall have a maximum amount of freedom of movement, while being sufficiently restrained to prevent personal injury.

The fact that they are being placed under restraint seems to stimulate and irritate most psychotics. Even a normal man who is rigidly restrained so that he is unable to turn on either side becomes restless after a period. The ideal is, on the indications for restraint, to apply the restraining bandages, administer sedatives, and then relax the restraint to promote sleep.

Recently a walking mental patient became very agitated, shouting and struggling as soon as the aircraft left the ground. He had to be forcibly restrained (by the method described above). He then received six grains of "Sodium Amytal" and after twenty minutes his struggles diminished. He complained that he could not go to sleep because of his restraints. The legs were first set free and then one hand, and when he was asleep finally all restraints were removed. He gave no further trouble on a ten hours' journey.

The reaction of psychiatric casualties is demonstrated in the following personal experiences from a Pacific flight, in which I had the doubtful privilege of being the first medical officer to accompany the same load of patients on the whole of the journey to San Francisco (forty hours' flying). The trip was far too long for a sick man, the patients needing at least a day's rest half-way. As it was, the only time they were taken out of the plane was for two hours at Hawaii, and even this short rest produced a remarkable

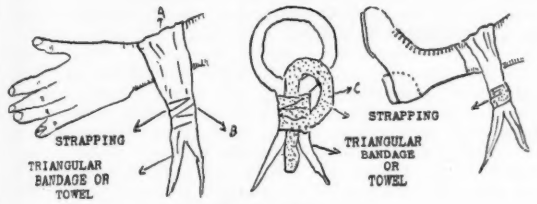

FIGURE VI.

improvement. One could not help noting that as the journey progressed the condition of the patients retrogressed to such an extent that one had to be taken off at Canton Island and treated by the parenteral administration of fluids. Two other points from this flight are, first, the efficiency of plasma given intravenously and continuous oxygen therapy as restoratives, and secondly, the amount of sedative a really acutely psychotic patient can absorb without apparent effect. One patient, receiving six grains of "Sodium Amytal" every four hours orally as well as intravenously, combined with the intramuscular injection of paraldehyde, still crawled out of his restraint.

Over-Sedation.

It should be remembered that sedatives in common usage are respiratory depressants, and may paralyse the respiratory centre, and also cause a pronounced fall in the blood pressure. As the altitude increases there is a proportionate fall in the partial pressure of oxygen, so that when the ventilation rate is the same, a less amount is available for absorption by the blood, and the oxygen saturation of the blood falls. At ground level, as the need for oxygen increases the respiratory centre is stimulated, with a resulting increase in rate and depth of respiration. At higher altitudes a given ventilation rate will result in the elimination of approximately the same amount of carbon dioxide as at ground level; but owing to the decreased partial pressure, it will not make the same amount of oxygen available for the blood. At altitudes of 10,000 feet and above a normal man compensates for the relative anoxia by increasing his respiratory rate following stimulation of the carotid body and aortic reflexes by lowered oxygen content of his blood. This normal physiological response will be embarrassed when the true stimulus threshold of the respiratory centre has been raised by over-sedation. Thus the seriousness of the depression of over-sedation at ground levels increases with altitude.

Psychotics must be carefully watched the whole time throughout the journey.

One amusing experience was when a wireless air gunner had trouble with his wireless and finally it would not work. They could not find the trouble until the nurse noticed that one of the psychotics had been unnaturally quiet after having given trouble previously. On investigation she discovered that he had bitten through one of the wires running down the wall of the aircraft.

Psychotics and psycho-neurotics react well in an emergency, such as a crash landing.

As psychotic casualties have proved to be the biggest problem in air evacuation, their management has been discussed at length, in the hope of obviating these mistakes in future air transport of such patients. Much of the treatment and the physiology of flight at the higher altitudes discussed in the preceding section applies equally well to the types of case now to be discussed.

Chest and Heart Conditions.

Casualties with chest and heart disorders travel remarkably well with correct management. Oxygen is essential; if the aircraft has to rise to any height, oxygen will invariably have to be administered. The remarkable thing is the height at which these casualties can travel safely, provided oxygen is available along with competent medical attention.

In a recent flight, at which a height of 19,000 feet was maintained for one and a half hours owing to weather conditions, there were two chest casualties. One had a post-pneumonic empyema, and with the aid of oxygen he said that he felt no ill-effects whatever except for a headache. These casualties were from the Borneo fighting. The other had a gunshot wound of the chest, a lacerated liver with fractured ribs, a torn diaphragm and a through-and-through wound of the right buttock. He was somewhat cyanosed, but not excessively, and had some chest pain. On the same load were two heart casualties, both with aortic regurgitation. These two were more cyanosed than anyone else on the journey, but were not particularly distressed.

Our experience in carrying various types of cardiac casualties, including patients with coronary thrombosis, is in support of the theory of Schieder, Graubeil and Borach, who stated that the seriousness of effect is proportional to the altitude, the duration of exposure and the amount of cardiac impairment. The type of lesion is not so important as the cardiac reserve; nor is the increased demand on the heart so important as the effect of anoxia on the heart muscle. With oxygen, heart casualties therefore travel well.

Recently a casualty was carried from Morotai with a diagnosis of malnutrition and "not yet diagnosed chest". On reaching 3,000 feet he became anoxic. The nurse immediately went to get the oxygen equipment; on her return he was black in the face. Immediate application of oxygen soon restored him to his ground-level colour. He received this oxygen for the rest of the journey, but could not stand the mask off his face even long enough to receive a drink. The pilot was instructed to fly low, and the patient maintained an excellent colour.

Only the prompt recovery made by this patient, along with adequate supply of oxygen, decided the nurse to continue with the journey, and she put him off at Townsville. On her return she inquired of his condition, and found that his condition had occasioned so much interest that his chest had been radiologically examined and extensive terminal carcinoma of both lungs had been found. Yet this patient travelled well with oxygen, and experience is the same for all similar types of lesions such as tuberculosis.

Other Respiratory Conditions.

Asthmatics thrive on altitude. The higher they rise, the better they feel, and the less laborious is their breathing. I have heard of only one patient having a true asthmatic attack in the air, and even he felt better than at ground level.

Thus it is seen that chest casualties travel well, provided adequate treatment is available.

Patients with acute colds should never be carried except in emergency. I have seen several cases of pneumonia follow such a proceeding, as well as several cases of *otitis media*. Many medical officers do not show much understanding when a flight nurse refuses such casualties. The flight nurse must always remember to instruct the pilot that a slow ascent and descent are desired in the case of pneumothorax. Patients with acute pneumonia should never be carried.

One patient with miliary tuberculosis had a severe cough, making it almost impossible to administer oxygen. The only solution was to maintain a low altitude or apply

oxygen intranasally. Oxygen given intranasally by a catheter is also used as the method of choice for patients with injuries to the face, such as wounds or burns.

General Medical Conditions.

Patients suffering from bacterial endocarditis, pernicious anæmia, leuchæmia and severe malaria, along with all types of anæmia, travel well with oxygen. Scrub typhus patients often become anoxic at low altitudes, but revive on application of oxygen and flight at a lower altitude.

Head Injuries.

Casualties with head injuries, especially those recently acquired, must always be carefully watched, as even those with moderately severe injuries do not travel well unless oxygen is given, anoxia often being observed at as low an altitude as 5,000 feet. Schnedorf and his co-workers demonstrated that brain concussion with or without skull fracture caused a depression of the oxygen level in the arterial blood from 5% to 44% below normal. Oxygen therapy decreased the elevation of body temperature and then restored the blood oxygen level to normal. As those findings were made at ground level, still more so do they apply to altitude, as has been observed on numerous occasions. Head casualties evacuted in forward areas often have had continuous oxygen therapy for the whole journey. It must be remembered that cerebro-spinal fluid commences to give off gas on reaching 12,000 feet and above; this adds to the high intracranial pressure manifested in most head injuries. A typical reaction to flight is shown by the following history.

The casualty had a gunshot wound of the skull. X-ray examination revealed a large area missing from the right frontal bone, with bone fragments lying in the frontal lobe and multiple foreign bodies in the left cerebral hemisphere; linear fractures extended from the upper margin of the missing area and frontal cerebral hernia was present. When evacuated two weeks later, this patient took flight fairly well, although his condition was still serious and complicated by hemiplegia. It was not necessary to fly over 8,000 feet, at which altitude the patient showed slight signs of anoxia, shortness of breath and some mental deterioration. Oxygen was administered, and after fifteen minutes the patient showed considerable improvement, and on arrival after three and a half hours' flying his condition was satisfactory.

Recently two head casualties were flown at an altitude of over 19,000 feet. With oxygen there were no reactions apart from increased headache. Codeine (0·25 grain) is the drug of choice for relieving this condition.

Patients with cerebro-spinal meningitis, including a semi-comatose child, aged three years, have been carried without any obvious ill-effects. However, the altitude reached in these cases was never over 2,000 feet.

Air-Sickness.

Much has been written on the subject of air-sickness, so I shall only mention some points of practical interest. Patients are not nearly as prone to it as expected. On one occasion, when a mixed load of patients and troops was carried, not one of the former was air-sick, but they were all continuously laughing at the sister ministering to the unhappy troops. Probably the prone position has a lot to do with this experience. One flight nurse stated that in the last year she had had only three cases of air-sickness. She attributes this to the fact that she always watched for the first symptoms of agitation and uneasiness, and on observing these immediately commenced treatment, which was the loosening of all tight clothing and the administration of 1·5 grains of "Luminal" and of glucose.

Oxygen prevents air-sickness in many cases when it is impending, and it is used as a routine measure by some sisters.

Another point worthy of mention is that fatigue is considerably lessened and sleep is often made possible by the wearing of rubber ear stoppers (similar to those used by bathers when surfing).

Conclusion.

From all the foregoing it is obvious that air evacuation is the ideal method of transporting wounded. It is now highly organized in this theatre of war. The Americans have over five squadrons and the Royal Australian Air Force more than two. Recently the Royal Navy has started its own units, the nurses and sick-berth attendants first taking the Royal Australian Air Force Medical Air Evacuation Course.

Any division in action, provided it has adequate air transport support, should be able to have nearly all its casualties evacuated by air. This is now of such importance that the Army, when considering the location for its hospitals, should take into account the distance they will be from the nearest transport strips. Every patient stated that the ambulance journey between the hospital and the strip was far worse than the whole journey by air.

The closest liaison between the Army and the Air Force Medical Air Evacuation Services is essential in the planning of lines of medical evacuation along the routes that the air transport squadrons will use.

Finally, it should be stressed once more that trained personnel for the care of medical casualties in flight, along with adequate medical and oxygen equipment, is essential to minimize as much as is humanly possible the risks of air evacuation. It has been found that it takes at least three months' actual practice before a flight team is regarded as satisfactory. When this standard is reached, any casualty who can be moved for a distance of ten miles on land can be transported anywhere by air.

Acknowledgement.

I wish to thank the Director-General of Medical Services, Royal Australian Air Force, Air Commodore E. A. Daley, F.R.A.C.P., H.K.P., for permission to publish this paper.

Addendum.

Since this paper was delivered the war has finished. The problem which then immediately arose was that of the repatriation of the casualties from the armed forces and the prisoners of war dispersed throughout the Pacific. In this the medical air evacuation units really proved their worth. In the Singapore area alone over 7,500 prisoners of war were transported by air from outlying parts within a month from the commencement of operations. This was accomplished by thirty Douglas "C47's", each having medical air evacuation personnel—either a flight sister or an orderly—attached to it. Some of these prisoners of war were desperately ill, especially those from Sumatra; many had advanced malnutrition, dysentery, beriberi and so on. Yet not one patient died in the air throughout this period. By bringing these desperately ill men, women and children quickly to medical aid, it is without question that many lives were saved, and once again it was proved that patients *in extremis* can be carried safely by air.

PRELIMINARY REPORT ON THE USE OF RADIO-ACTIVE PHOSPHORUS IN AUSTRALIA.[1]

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Director, Queensland Radium Institute, Brisbane.

Reports to hand recently from Canada and the United States of America encourage the belief that increased supplies of artificially produced radioactive substances will be available in the near future for therapeutic application in Australia. Although it is as yet too early to assess results in a proportion of the cases, I am prompted by numerous inquiries to describe the method of using P^{32} in Brisbane and to report a small series of patients treated over the past two years.

Elementary Biophysical Considerations.

All the elements above bismuth in the periodic table are naturally radioactive, and each spontaneously emits

[1] Submitted for publication July 25, 1946.

radiation in the process of transmutation which results from the unstable or "top-heavy" atomic nucleus. This radioactivity is a function of the nucleus and is not affected by any chemical or physical changes in the particular atom.

The atom of natural phosphorus is denoted $_{15}P^{31}$. The prefix signifies the positive charge of 15 units from 15 protons in the nucleus balanced by a similar number of negatively charged electrons. The suffix indicates an atomic weight equivalent to 31 made up of the 15 protons and 16 neutrons. When this nucleus is bombarded by high-speed deuterons (particles each containing one proton and one neutron), it is possible for some of the impacts to result in a neutron entering the phosphorus nucleus, thus changing its mass to 32 units.

The resulting isotope of phosphorus, $_{15}P^{32}$, often referred to as P^{32} for brevity, is unstable and emits a β ray which is actually a negatively charged electron. The loss of a negative charge amounts in the atomic configuration to the acquisition of a positive charge, and the resulting product of the disintegration is $_{16}S^{32}$—stable sulphur.

TABLE I.

Decay of Radioactive Phosphorus (P^{32}). Half-value Period, 14·3 Days.

Time in Days.	Fraction Remaining.	Time in Days.	Fraction Remaining.
0	1·000	22·0	0·344
0·5	0·975	23·0	0·328
1·0	0·953	24·0	0·312
1·5	0·930	25·0	0·297
2·0	0·902	26·0	0·283
2·5	0·886	28·0	0·257
3·0	0·865	30·0	0·233
3·5	0·844	32·0	0·212
4·0	0·824	34·0	0·192
4·5	0·804	36·0	0·174
5·0	0·785	38·0	0·158
5·5	0·766	40·0	0·144
6·0	0·747	42·0	0·130
6·5	0·730	44·0	0·119
7·0	0·712	46·0	0·107
8·0	0·678	48·0	0·097
9·0	0·655	52·0	0·080
10·0	0·616	56·0	0·066
11·0	0·586	60·0	0·054
12·0	0·559	64·0	0·045
13·0	0·532	68·0	0·037
14·0	0·507	72·0	0·030
15·0	0·483	76·0	0·025
16·0	0·460	80·0	0·021
17·0	0·438	90·0	0·013
18·0	0·417	100·0	0·008
19·0	0·398	120·0	0·003
20·0	0·379	140·0	0·001
21·0	0·361		

The physical properties of radiophosphorus may be briefly enumerated as follows: (i) Its half-life period is 14·3 days. (ii) It emits a β ray, the average energy of which is approximately 600,000 electron volts. (iii) It behaves in chemical reactions exactly as the naturally found isotope. (iv) Radiation effects will be local only, the radiation having an average range in tissue of the order of two millimetres.

As it is possible with an instrument known as a Geiger counter to detect and estimate quantitatively very small amounts of any radioactive substance, radioactive phosphorus in the form of a soluble inorganic salt (usually sodium hydrogen phosphate) lends itself to many tracer investigations. The role of inorganic phosphates in the synthesis of nucleoproteins and phospholipids has been studied in this manner.

An important biological property of phosphorus is its selective uptake by certain tissues. The principal tissues concerned are lymph glands, spleen, bone and bone marrow, and the same localization occurs in most growing tissues, which metabolize phosphorus rapidly. This point can be illustrated by autoradiographs—for example, Figures I and II, which illustrate the absorption of radioactive phosphorus in the leaves and green fruit of a tomato plant. (The biological material was prepared by myself, and the autoradiographs were taken by Mr. A. W. Knight.)

Technical Production of P^{32}.

Limitations of space preclude a description of the cyclotron, the massive machine developed through the genius of Professor E. O. Lawrence at Berkeley, California. P^{32} is produced when a stream of deuterons, accelerated by means of a cyclotron, is directed onto a layer of ordinary phosphorus. Later, chemical solution of the product is effected, and the P^{32} is customarily used in the form of sodium hydrogen phosphate. The initial strength is usually standardized in the Croker Laboratory to 750 microcuries per millilitre of solution. Even in this concentration only one phosphorus atom in 10,000,000[1] or thereabouts will be radioactive, the remainder being atoms of stable phosphorus which escaped the nuclear transformation.

TABLE IIA.

Radioactive Phosphorus. Calculation of Retained Activity following Intravenous Administration of Radiophosphorus.
(*After* Low-Beer, Lawrence and Stone.[(4)][1])

Days.	Percentage of Administered Dose.
1	90
2	83
3	77

[1] For the first three days the activity on each day is calculated as a percentage of the administered dose; for each day after the third day the activity is calculated as a percentage of the activity retained on the third day.

TABLE IIB.

Radioactive Phosphorus. Calculation of Retained Activity following Intravenous Administration of Radiophosphorus.
(*After* Low-Beer, Lawrence and Stone.[(4)][1])

Days.	Percentage of Third Day Activity.	Days.	Percentage of Third Day Activity.
4	94	19	37
5	88	20	35
6	83	21	33
7	78	22	31
8	74	23	29
9	69	24	27
10	65	25	26
11	61	26	24
12	58	27	23
13	54	28	21
14	50	29	20
15	48	30	19
16	45	31	18
17	42	32	17
18	40	33	15

[1] For the first three days the activity on each day is calculated as a percentage of the administered dose; for each day after the third day the activity is calculated as a percentage of the activity retained on the third day.

The supply of radioactive phosphorus and other artificially produced radioactive isotopes will soon be considerably augmented by the preparation of these substances in a plutonium "pile". This apparatus is stated to produce from 500 to 1,000 times the output of P^{32} from a large cyclotron.[(3)]

Estimations of Activity.

Exact estimations of activity as at date of dispatch from the United States of America are given, and it is a simple matter to calculate from a table of decay the strength at any specified date (see Table I). A Geiger counter is necessary for accurate quantitative measurements of biopsy material, and it is anticipated that the local biophysical laboratory will be equipped with this item of apparatus in the near future. In the meantime a β-ray electroscope has been calibrated for P^{32} and approximate estimations of the differential absorption ratio in lymph gland and other tissues have been made on several occasions. This ratio varies over the range 2:1 up to 12:1 or even higher.

Case Number, Patient, Sex, and Age. Years.)	Personal and Family History.	Clinical Diagnosis.	Biopsy Diagnosis.	Date of First Examination.	Course of Present Illness.	Previous Treatment
I. W.J., M., 59.	35 years coal mining in Scotland. Pneumoconiosis and tuberculosis of lungs radiologically.	Lymphosarcoma.	February, 1944: Lymphocytic lymphosarcoma.	4.3.44	Enlargement of glands, axillæ and groins, 6 months—increasing lassitude—small loss of weight.	None.
II. T.C., M., 62.	Not relevant.	? Hodgkin's disease.	16.3.44: Hodgkin's disease (gland from axilla). 30.5.44: Lumen of œsophagus, squamous epithelioma, grade IV.	17.3.44	Tumour, right supraclavicular area, 6 months; discrete glands each axilla; no loss of weight.	None.
III. H.G., M., 33.	Not relevant.	(i) Lymphosarcoma. (ii) Supervening chronic lymphatic leuchæmia.	(a) 1.11.41: Groin glands: "Simple fibrous overgrowth. No other abnormality." (b) 22.5.43: "General lymphoid hyperplasia. If pathological, it is lymphosarcoma."	27.5.43	Enlarged glands found 28 months previously when patient undergoing herniorrhaphy. These receded. Present enlargement noticed for 3 weeks only.	Deep X-ray therap lymphosarcoma, for leuchæmia.
IV. W.C., M., 44.	Marked obesity.	Lymphosarcoma.	Lymphosarcoma.	18.5.44	Swelling in right groin 4 months, in left axilla 2 months.	Deep X-ray therap right inguinal and axillary areas and field to trunk.
V. W.F., M., 47.	Not relevant.	Giant follicular lymphadenopathy[4] (Brill-Symmers disease).	Giant follicular lymphadenopathy.	18.6.43	Swelling right groin 12 months, other gland groups involved 2 months.	Deep X-ray therapy, 1943.
VI. H.H.J., M., 48.	Not relevant.	Giant follicular lymphadenopathy Brill-Symmers disease).	Giant follicular lymphadenopathy.	3.12.42	Enlargement of glands of neck and axillæ for 3 months.	Deep X-ray therapy occasions).
VII. S.M., M., 53.	Not relevant.	Chronic myeloid leuchæmia.	Not performed.	3.4.44	First symptom, hardness of left side of abdomen of 2 months' duration.	Deep X-ray therap spleen and whole baths. (Average rem 4 months' duration.
VIII. S.W., F., 44	Three children, youngest 16 years.	Chronic myeloid leuchæmia.	Not performed.	14.6.45	First symptom left-sided abdominal swelling for 4 months.	None.
IX. M.B., M., 30.	Leading aircraftsman in Royal Australian Air Force.	Chronic myeloid leuchæmia.	Not performed.	6.2.45	First symptom, priapism 4 months before. For last 3 weeks continuous priapism, which necessitated suprapubic cystotomy.	Previous deep X-ray t to spleen and whol irradiation Februar March, 1945. As intervals to April, 1
X. T.A., F., 39.	Not relevant.	Chronic myeloid leuchæmia.	—	14.6.43	Sustained fracture of seventh right rib in motor accident. Unusually severe hæmoperitoneum and hæmorrhage into tissues led to hæmatological examination. No symptoms otherwise.	Whole body X radia
XI. B.W., M., 52.	Not relevant.	Chronic lymphatic leuchæmia.	—	28.1.44	Noticed numerous swellings over past 4 months.	Deep X-ray therapy, to individual lymph groups. Remissions, months.
XII. M.W., M., 51.	Not relevant.	Chronic lymphatic leuchæmia.	—	6.8.45	Abdominal swelling over 6 months. Glands enlarging past 3 months.	Deep X-ray therapy only to spleen, discon when P^{32} arrived.
XIII. D.V., F., 39.	Not relevant.	Chronic lymphatic leuchæmia.	—	9.8.45	Painless swelling of glands in neck and other sites for 6 weeks.	None.

	Physical Findings at Time of P^{32} Treatment.	Results of Marrow Biopsy.	P^{32} Treatment.	Response to Treatment.	Any Complications from P^{32} Treatment.
.44	Discrete rubbery glands up to 2 centimetres diameter of axillæ and left groin. Gland mass 3 centimetres diameter, right groin. Smaller generalized glandular enlargement.	11.3.44: Normal bone marrow.	4-13.3.44: 7,081 microcuries. Rapid fractional saturation method. Total retained activity over 3,000 microcuries for 15 days. (See chart.)	First remission, 5 months. Supplementary deep X-ray therapy given. Patient reasonably well September, 1945. Died with recurrent generalized lymphadenopathy December, 1945.	None.
.44 only.	Massive right supraclavicular glands. Bilateral enlarged axillary glands. Later: Latent carcinoma of œsophagus. 30.5.44: Œsophagoscopy and biopsy.	Not performed.	Tracer dose only. 645 microcuries = 8·2 microcuries per kilogram. Differential absorption ratio = 10·9.	Palliative deep X-ray therapy given.	None.
.44	Generalized enlargement of all palpable lymph glands (up to 2 centimetres diameter). Rubbery.	Not performed.	26-31.3.44: 2,200 microcuries, supplementary to deep X-ray therapy (anteriorly to spleen and whole body irradiation).	No further treatment for 12 months. Blood count 21.2.46: Red blood cells 4,700,000 per cubic millimetre, hæmoglobin value 92%, white blood cells 4,000 per cubic millimetre (neutrophile cells 70%, lymphocytes 28%), platelets, fair number. Patient very well. Spleen and glands not palpable 14.6.46.	Transient anæmia and thrombocytopenia.
.44	Lymphadenopathy right inguinal and left axillary regions. Later developed lymphosarcomatous infiltration of left pectoral muscle and left testis.	Not performed.	1-8.6.1944: 3,908 microcuries in 5 injections. Total retained activity over 2,000 microcuries for 10 days.	Inadequate dosage of P^{32}. Further treatment by X-ray therapy for choice owing to size of patient and the leucopenia. Died 20.5.45.	None.
.45	Advanced recurrences of all gland groups. Tumour 7 by 7 by 4·5 centimetres left epitrochlear region threatening to fungate. Abdominal glands palable.	Not performed.	5,800 microcuries by rapid fractional saturation method. Total retained activity over 3,000 microcuries for 12 days.	Palliation only. Glands diminished. Died 20.8.45. Probably unsuitable subject as having too large a bulk of malignant tissue.	None.
.45	Small glands in superficial groups and mass of glands in epigastrium.	11.7.45: "Total leucoblastic tissue reduced. Much increase of immature forms and marked lymphocytic infiltration."	2,548 microcuries over 6 days. (Treatment discontinued after report on sternal bone marrow.)	Moderate improvement. Abdominal mass still present (14.6.46).	Leucopenia aggravated.
.45	Moderate splenomegaly.	Not performed.	11-19.6.45: 3,532 microcuries in 4 injections. 5.7.45: 982 microcuries in 1 injection. 11.7.45: 644 microcuries in 1 injection.	Disappointing response. Died 23.10.45.	None.
.45	Marked splenomegaly with moderate anæmia. No glandular enlargement.	Not performed.	14-23.6.45: 2,870 microcuries in 4 injections. 5-14.7.45: 3,500 microcuries in 5 injections. 6-14.9.45: Deep X-ray therapy, 550*r* skin dose over spleen.	Very gratifying response after large dose. Incomplete reduction of splenic enlargement until small dose of X radiation given.	None.
.45	Moderate splenomegaly, palpable glands cervical and inguinal regions.	Not performed.	14-23.6.45: 2,270 microcuries in 4 injections. 11.7.45: 900 microcuries in 1 injection. 19-23.11.45: 3,617 microcuries in 4 injections. (Retained activity over 1,500*r* for 14 days.) Some supplementary deep X-ray therapy in intervals when P^{32} not available.	Fair response, but remissions unusually brief.	None.
.45	Moderate splenomegaly. Progressive anæmia, malaise.	Not performed.	13-15.6.45: 1,646 microcuries in 2 injections. 19-31.10.45: 4,138 microcuries in 7 injections.	Initial response pleasing. Poor remission after second course. Last count followed blood transfusion and further X radiation in small doses to spleen and long bones. Died 14.6.46.	None.
.45	Generalized enlargement of lymph glands. Marked splenomegaly. Condition deteriorating and P^{32} given at earnest request of patient and relatives.	Not performed.	11-15.6.45: 2,100 microcuries in 3 injections. Treatment curtailed on account of thrombocytopenia. Blood transfusions given.	Poor, but disease had obviously already reached a terminal phase. Died 11.9.45.	Thrombocytopenia.
.45	Marked splenomegaly and generalized glandular enlargement.	Not performed.	9-22.8.45: 4,090 microcuries in 6 injections. 25.9.45-5.10.45: 5,112 microcuries in 5 injections.	Poor response to first course. Larger dosage followed by depression of hæmatopoietic function. Blood transfusion given. 21.5.46: Now reasonably well.	Transient anæmia.
.45	Glands swollen and palpable in all superficial groups. Spleen not palpable.	Not performed.	9-21.8.45: 4,265 microcuries in 5 intravenous injections.	Patient very well 8 months after initial course of P^{32}.	None.

TABLE

Case Number, Patient, Sex, and Age. (Years.)	Personal and Family History.	Clinical Diagnosis.	Biopsy Diagnosis.	Date of First Examination.	Course of Present Illness.	Previous Treatment
XIV. S.K., M., 19.	Royal Australian Air Force.	Acute lymphatic leuchæmia.	—	17.10.45	Extreme pain and swelling, left side of chest and arm for one month. Inadequate relief from narcotics.	None.
XV. R.J., M., 61.	Not relevant.	Lymphosarcoma.	Lymphosarcoma (lymphocytic type).	17.11.45	Swollen gland, right side of neck, 20 months. Gradually enlarging. No weight loss.	None.
XVI. H.E., M., 72.	Not relevant.	Chronic lymphatic leuchæmia.	—	26.7.43	Various smooth painless swellings, 6 months.	Deep X-ray therapy regional glands July, 1943, to July with remissions.
XVII. M.K., M., 25.	Australiam Imperial Force.	Lymphosarcoma.	Lymphosarcoma.	29.1.46	Generalized glandular enlargement and large abdominal mass, 6 weeks.	None.
XVIII. D.J., M., 50.	Not relevant.	*Polycythæmia vera.*	Marrow biopsy (see below).	19.3.46	High colour of skin, particularly of face and hands. Few symptoms.	None.

Biological Considerations.

In chronic myeloid leuchæmia good remissions are obtained by wide-field X-ray therapy (synonyms are teleröntgenotherapy or whole-body irradiation), and this means of treatment is favoured by many therapists to supplement regional deep X-ray therapy in lymphosarcoma,[3] which is so often a generalized disease. When this form of treatment is delivered to anterior and posterior aspects of the body, a fairly uniform dosage to various organs and tissues is obtained. The selective absorption of P^{32} by bone marrow, by growing tissues and in particular by the reticulo-endothelial tissues explains its hypothetical advantages over deep X-ray therapy in the leuchæmias and the lymphosarcomatous group of diseases.

The biological effects in tissue result from disturbance of cellular metabolism by ionization along the track of the β particle. These cytological changes are similar to those produced by X radiation or γ radiation.

Whilst one bears in mind the uneven distribution of P^{32} in the body, it is still of interest to know the total amount remaining in the body at any given time. Table II is copied from an article by Low-Beer, Lawrence and Stone,[5] and gives the average total retained activity after allowance is made for decay and excretion. These figures apply after intravenous administration and would be much lower for the first three days if the material was given by mouth, as the loss under these conditions is approximately 20% owing to lack of absorption in the alimentary tract.

Clinical Factors in Radioactive Phosphorus Therapy.

The knowledge that P^{32} is relatively concentrated in bone and lymphatic tissue determines its principal usage in leuchæmia, in *polycythæmia vera* and in lymphosarcoma. The irradiation of bone marrow imposes a limiting factor in the treatment of other diseases, and it would not appear logical to attempt the treatment of bone metastases, osteogenic sarcoma or Ewing's tumour of bone, as these conditions would require a dosage of P^{32} which would in itself be damaging to the hæmatopoietic system. For the same reason it is doubtful whether results in Hodgkin's disease and in multiple myeloma would justify the choice of P^{32} for treatment in preference to deep X-ray therapy.

Earlier reports suggested the use of radioactive phosphorus to prevent the occurrence of hæmic metastases at

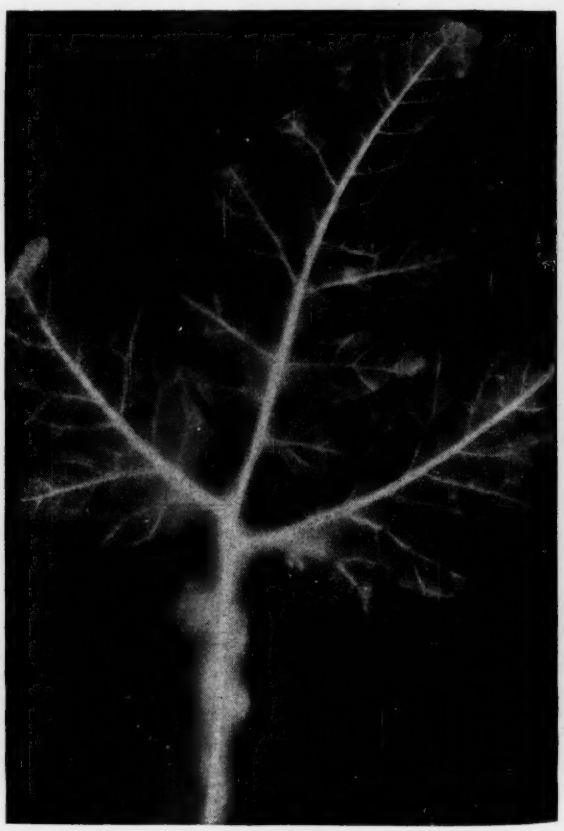

FIGURE I.

Autoradiograph of a tomato leaf which had been allowed to absorb P^{32}.

	Physical Findings at Time of P^{32} Treatment.	Results of Marrow Biopsy.	P^{32} Treatment.	Response to Treatment.	Any Complications from P^{32} Treatment.
	X-ray examination revealed massive mediastinal swelling. Condition caused dyspnœa and extreme venous engorgement of chest wall and left upper extremity.	Not performed.	19-26.10.45: 2,836 microcuries in 5 injections, supplemented by few doses of deep X-ray therapy therapy to hasten effect on massive mediastinal tumour.	Dramatic relief within few days. Died 28.11.45.	None.
	Mass of right lower cervical glands 6 by 4 by 4 centimetres. Moderate enlargement of right axillary glands.	Not performed.	4,708 microcuries in 5 intravenous doses over 6 days. Total retained activity over 2,500 microcuries for 9 days. Supplementary deep X-ray therapy given to main mass from 6.12.45; 2,000r skin dose in 8 days.	Patient well and no glands palpable on 31.5.46.	None.
	General condition failing. Gross œdema of lower extremities. X-ray examination revealed atheromatous aorta.	Not performed.	16-24.12.45: 3,700 microcuries in 5 injections.	Patient died of myocarditis before response could be assessed.	None.
	Recent laparotomy disclosed massive lumbar lymphadenopathy and multiple peritoneal nodules.	Not performed.	29.1.46-7.2.46: 4,670 microcuries in 6 doses over 9 days. Retained activity more than 2,000 microcuries for 12 days.	Condition too far advanced. No appreciable relief. Died 16.4.46.	None.
	Cyanosis of face and exposed parts. No splenic or hepatic enlargement.	30.3.46: Marrow rarefied; fewer cells per unit area.	5,400 microcuries in 4 doses over 4 days. Total retained activity over 2,500 microcuries for 12 days.	Marked improvement.	None.

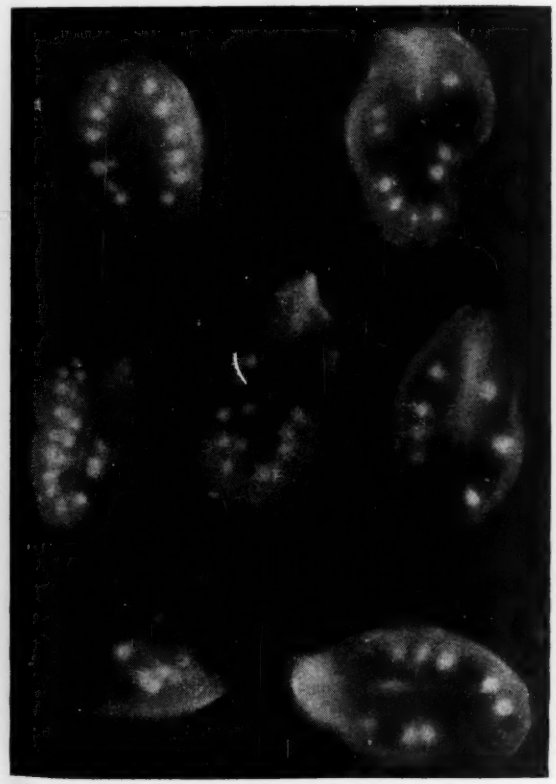

FIGURE II.

Autoradiograph from very thin slices of a green tomato. Note the high uptake of P^{32} in the seeds. A spray of unripe fruit was placed with the stem in a very weak solution of P^{32}.

the time of operation for a Ewing's tumour or an osteogenic sarcoma. It would appear unlikely that treatment on these lines would be effective. Willis[9] states that the average diameter of tumour emboli dispersed in the blood stream is of the order of 200μ. Any radioactive material contained in such a small mass would exert its maximum ionization effects outside the pathological cells in the surrounding tissues.

The intravenous administration of P^{32} has the following advantages over the oral method: (i) it is more economical; (ii) uptake by diseased tissues is higher.

Fractional doses at intervals of one or two days are desirable when one is building up a high level of P^{32} retention in the body, especially when using material of reduced potency. The solution commonly supplied after cyclotron preparation contains fifteen milligrammes of sodium hydrogen phosphate per millilitre. When the solution is first prepared the strength is generally 750 microcuries per millilitre of solution, but this value has often fallen to 300 microcuries per millilitre by the time of administration to patients in Australia. It can be seen that a dose of 3,000 microcuries would incidentally involve the injection of 150 milligrammes of sodium hydrogen phosphate. Such a quantity added to the phosphorus in the patient's diet may exceed the normal daily requirements of phosphorus, and a considerable fraction may well be excreted before fixation in the tissues can occur.

Before any treatment is commenced, a preliminary study of the blood picture is essential and a bone marrow biopsy is desirable. During therapy the earliest signs of high dosage effects are a diminution in the number of reticulocytes, thrombocytopenia, and somewhat later leucopenia. Anæmia is a relatively late manifestation. Blood counts are made frequently, and the administration of radioactive phosphorus is interrupted on the occurrence of any of the following changes: (*a*) a fall in the white blood cells below 6,000 per cubic millimetre; (*b*) a fall in the platelet count below 100,000 per cubic millimetre; (*c*) a fall in the red blood cells of more than 15% of their original number.

The treatment with P^{32} of patients with massive lymphadenopathy is apt to prove unsatisfactory, owing to the dispersal of available P^{32} and resulting low concentration per unit volume of diseased tissue.

Radiation sickness has not been encountered in this small series of patients treated by P^{32}.

It is appropriate to combine the administration of P^{32} with deep X-ray therapy. This has been done frequently in our practice, occasionally on account of inadequacy of supplies of P^{32}, and sometimes to hasten the resolution of a large glandular mass. Overseas authorities would appear to favour the giving of X-radiation first; but in theory one would expect previously irradiated tissue to show a lessened absorption ratio, and the alternative sequence has been adopted in most of the supplementary treatments given at this centre.

Dosage of P^{32} and Mode of Administration.

For reasons already stated, doses of 1,000 microcuries were seldom exceeded, and these were repeated daily or at intervals of two or three days according to the desired level of total retained activity. In this series of cases the intravenous route was used invariably.

tion level, the aim being to maintain a low but continuous radiation effect which gradually influences the white cell count. This procedure has so far been impracticable in Brisbane with the supplies available, and it has been the practice to develop by a rapid fractional saturation method a retained activity of the order of 2,000 microcuries, and to maintain this level for a week or longer whilst the blood count is observed very closely.

Polycythæmia Vera.

Owing to the fact that the treatment of *polycythæmia vera* requires a relatively large quantity of the radioactive isotope, only one such case is included in this series. This patient has made a dramatic initial response, and the duration of remission will be of much interest.

Conclusions.

The foregoing pages attempt to describe briefly a method of using P^{32} and indicate the results of treatment in a small group of patients. Most of this work was carried out in wartime, with a depleted medical staff and inadequate physical apparatus for the efficient quantitative estimations of radioactivity in biopsy material.

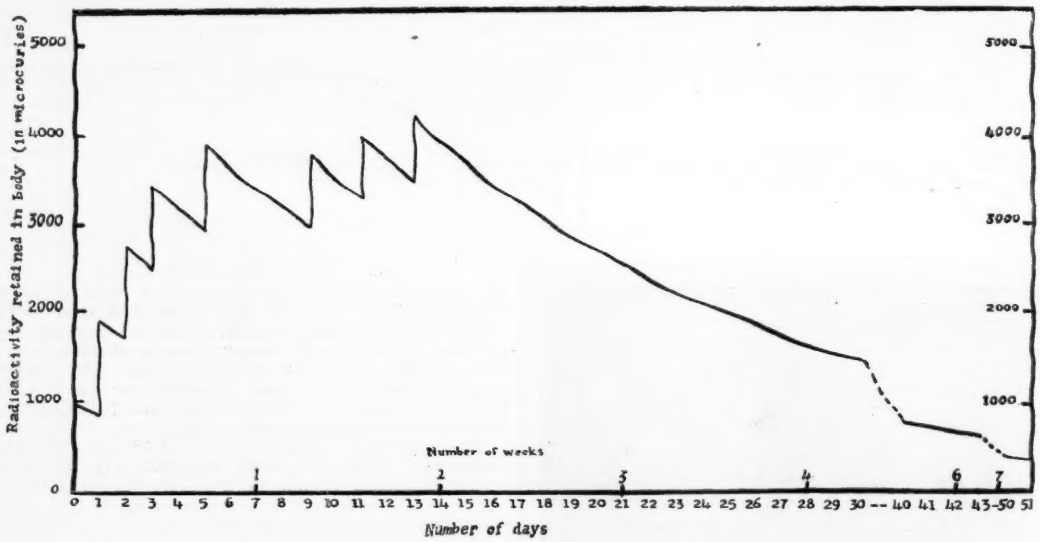

FIGURE III. Dosage Chart. Patient I.

Lymphosarcoma.

In the treatment of lymphosarcoma, American writers[5] describe several methods of administration.

1. Simple saturation method. This consists of one large initial dose, which is followed by smaller doses at intervals of three days to bring the level up again to the original figure, as in Table II.

2. Fractional saturation method. This is similar to the first method, with the exception that the peak radiation level is attained gradually over a period of ten to twelve days.

3. Fractional method. This is a less intense course, comprising doses of approximately 1,000 microcuries given at longer intervals (often seven days).

To adhere to any of these methods would necessitate a continuous and unfailing supply of radioactive material. In Brisbane, a rapid fractional saturation method was developed from considerations of expediency and economy of P^{32}. In general, the total retained activity was built up to 2,500 or 3,000 microcuries and kept at this level for a period of ten to fifteen days. No immediate radiation reactions were experienced. For an example of a typical dosage chart see Figure III.

Leuchæmia.

In the treatment of the leuchæmias most American therapists advise moderate doses at relatively longer intervals than in the treatment of lymphosarcoma. Generally no attempt is made to build up a definite radia-

The patients treated were all suffering from incurable conditions, and some were accepted when approaching a terminal stage of the disease. Nevertheless, some patients made a gratifying response even when showing evidence of resistance to deep X-ray therapy. There has been a tendency to use the new and little understood treatment, at the request of physicians and patients alike, in very advanced cases. Results in most cases of lymphosarcoma give an impression of similarity to those obtainable with deep X-ray therapy. In the chronic forms of leuchæmia, and more especially in the relatively early cases, I consider the remissions to have been longer than are usually seen after any form of X-radiation. It is certain that results could be further improved in the presence of an ample supply of P^{32}.

Acknowledgements.

My thanks are accorded to the following: (i) to Dr. J. H. Lawrence, Director of the Croker Laboratory, University of California, Berkeley, California, for his generous parcels of P^{32} at a time when supplies of material were taxed severely; this generosity has made possible the first therapeutic usage in Australia of any artificially prepared radioactive material; (ii) to Major Paul W. McDaniel, formerly Assistant Professor of Physics, Alabama Technical Institute, Auburn, Alabama, for much

personal advice and encouragement in the early stages of this work; (iii) to Professor A. P. Murphy, University of Queensland, for having recommended a large proportion of the patients and for assistance in the medical aspects of these cases; (iv) to the Deputy Commissioner and staff, Division of Import Procurement, Brisbane, for effecting prompt delivery of supplies at all times; (v) to the staff of the Queensland Radium Institute and ancillary branches

TABLE IIIB.

Results of Blood Counts.

Case Number.	Date.	Red Blood Cells per Cubic Millimetre.	Hæmoglobin Value.	White Blood Cells per Cubic Millimetre.	Platelets per Cubic Millimetre.
I	23. 2.44	4,700,000	92%	16,100	Normal
	22. 3.44	5,070,000	100%	8,300	324,000
	10. 7.45	4,570,000	80%	10,000	Normal
II	6. 3.44	4,900,000	95%	9,900	Normal.
III	31. 5.43	5,200,000	100%	6,000 (Neutrophile cells 60%, lymphocytes 36%, monocytes 2%, eosinophile cells 2%)	4,000,000
	11. 2.44	5,200,000	98%	4,200 (Neutrophile cells 72%, lymphocytes 27%)	Normal
	18. 5.44	3,550,000	67%	120,000 (Neutrophile cells 3%, lymphocytes 97%)	106,000
	7. 6.44	4,070,000	80%	10,800 (Neutrophile cells 12%, lymphocytes 85%)	126,000
	26. 8.44	3,090,000	60%	130,000 (Neutrophile cells 6%, lymphocytes 94%)	Reduced
	5.10.44	3,000,000	58%	12,400 (Neutrophile cells 13%, lymphocytes 86%)	36,000
	21. 2.46	4,700,000	92%	4,000	Normal
	19. 6.46	4,470,000	85%	5,000 (Neutrophile cells 78%, lymphocytes 21%)	Slightly reduced
IV	1. 6.44	5,400,000	100%	4,800 (Neutrophile cells 66%, lymphocytes 34%)	Normal
	7. 7.44	5,024,000	86%	4,300 (Neutrophile cells 61%, lymphocytes 20%)	—
V	31. 5.43	6,100,000	120%	8,000	232,000
	29. 3.45	4,700,000	88%	4,900	Normal
VI	5. 7.45	5,020,000	98%	3,160 (Neutrophile cells 44%, lymphocytes 54%)	79,000
	9. 7.45	—	—	4,020 (Neutrophile cells 64%, lymphocytes 30%)	94,000
	17. 7.45	4,270,000	80%	2,400 (Neutrophile cells 44%, lymphocytes 56%)	Reduced
	13. 6.46	4,150,000	80%	5,000	104,000
VII	11. 4.44	4,600,000	85%	270,000	Normal.
	11. 6.45	5,400,000 (Reticulocytes 2%)	106%	52,000 (Lymphocytes 4%)	303,000
	5. 7.45	4,900,000 (Reticulocytes 5%)	90%	20,000 (Lymphocytes 4%)	400,000
	24. 8.45	5,040,000 (Reticulocytes 2·2%)	96%	77,000 Lymphocytes 5%)	Normal
VIII	12. 6.45	3,400,000	65%	105,000 (Lymphocytes 6%, myelocytes + + +)	Normal
	3. 7.45	—	—	78,000 (Lymphocytes 5%, myelocytes + + +)	Normal
	19. 7.45	4,600,000	65%	53,000 (Myelocytes + +)	400,000
	6. 8.45	4,090,000	60%	27,500 (Lymphocytes 15%, myelocytes +)	Normal
	20. 2.46	4,480,000	82%	11,000 (Lymphocytes 14%)	Normal
	15. 5.46	4,300,000	82%	33,000 (Lymphocytes 4%)	Normal
IX	6. 2.45	2,800,000	54%	273,000 (Lymphocytes 1%, myelocytes + +)	420,000
	26. 2.45	4,300,000	80%	55,200 (Lymphocytes 3%, myelocytes +)	Normal
	14.11.45	5,300,000	102%	93,400 (Lymphocytes 4%, myelocytes +)	Normal
	21. 1.46	5,100,000	100%	40,000 (Lymphocytes 4%, myelocytes +)	Normal
	13. 5.46	4,830,000	96%	25,500 (Myelocytes +)	—

TABLE IIIB.—*Continued.*
Results of Blood Counts.—Continued.

Case Number.	Date.	Red Blood Cells per Cubic Millimetre.	Hæmoglobin Value.	White Blood Cells per Cubic Millimetre.	Platelets per Cubic Millimetre.
X	17. 5.43	1,800,000	30%	58,000 (Neutrophile cells 90%, lymphocytes 8%)	Normal
	14. 6.43	4,200,000	80%	60,000 (Neutrophile cells 81%, lymphocytes 18%)	Normal
	12. 6.45	3,200,000	62%	20,000	Normal
	26. 6.45	4,220,000	82%	10,300 (Lymphocytes 17%)	Normal
	17.10.45	3,300,000	65%	80,000 (Lymphocytes 6%)	Normal
	9.11.45	2,940,000	57%	4,800 (Lymphocytes 14%)	Normal
	17.12.45	3,050,000	48%	158,000 (Lymphocytes 4%, myelocytes ++)	Reduced
	13. 3.46	3,830,000	74%	27,000 (Lymphocytes 13%)	—
XI	1. 2.44	4,100,000	80%	184,000 (Neutrophile cells 4%, lymphocytes 96%)	Reduced
	8. 3.44	4,400,000	86%	11,400 (Neutrophile cells 29%)	Reduced
	11. 6.45	2,900,000 (Reticulocytes 4%)	56%	117,000	Normal
	19. 6.45	3,200,000	60%	130,000	25,600
XII	1. 8.45	3,600,000 (Reticulocytes 3%)	70%	50,000 (Neutrophile cells 4%, lymphocytes 96%)	Normal
	25. 9.45	3,900,000	76%	70,000 (Neutrophile cells 7%)	—
	29.10.45	1,540,000	38%	27,600 (Neutrophile cells 15%)	Reduced
	7. 3.46	4,300,000	82%	38,000 (Neutrophile cells 9%)	Reduced
	9. 5.46	4,600,000	90%	56,000 (Neutrophile cells 10%)	—
XIII	10. 8.45	4,450,000	85%	50,000 (Neutrophile cells 11%, lymphocytes 89%)	260,000
	13. 9.45	4,100,000	88%	13,000 (Neutrophile cells 58%, lymphocytes 41%)	Normal
	24. 1.46	4,400,000	82%	14,000 (Neutrophile cells 58%, lymphocytes 42%)	Normal
	18. 4.46	5,050,000	96%	13,500 (Neutrophile cells 59%, lymphocytes 41%)	Normal
XIV	19.10.45	3,660,000	68%	340,000 (Neutrophile cells 2%, myeloblasts +, lymphoblasts +)	Reduced
	2.11.45	4,100,000	78%	160,800	—
XV	17.11.45	5,300,000	100%	10,000 (Neutrophile cells 74%, lymphocytes 24%)	Normal
	17.12.45	4,750,000	90%	7,000 (Neutrophile cells 84%, lymphocytes 13%)	Normal
	31. 5.46	Reported to be normal	Reported to be normal	Reported to be normal	Reported to be normal
XVI	26. 7.43	4,460,000	85%	73,000 (Neutrophile cells 9%)	289,000
	4.12.45	3,110,000	60%	72,500 (Neutrophile cells 17%)	Normal
XVII	30. 1.46	4,500,000	86%	7,000 (Neutrophile cells 82%, lymphocytes 15%)	Normal
XVIII	12. 3.46	9,250,000	180%	8,700 (Neutrophile cells 85%, lymphocytes 15%)	Normal
	29. 4.46	7,900,000	154%	7,400 (Neutrophile cells 78%, lymphocytes 18%, eosinophile cells 4%)	—
	12. 6.46	5,370,000	104%	7,000 (Lymphocytes 33%, eosinophile cells 2%)	Normal

of the Brisbane Hospital for enthusiastic cooperation in developing to maximum efficiency a mode of treatment new to this country.

References.

(1) J. M. Kenney and L. F. Craver: "Further Experiences in the Treatment of Lymphosarcoma with Radioactive Phosphorus", *Radiology*, Volume XXXIX, November, 1942, page 598.

(2) A. H. Compton: "Atomic Energy as a Human Asset", *Nature*, Volume CLVII, February 9, 1946, page 146.

(3) F. Medinger and L. F. Craver: "Total Body Irradiation with Review of Cases", *American Journal of Roentgenology*, Volume XLVIII, November, 1942, page 651.

(4) J. M. Kenney, L. D. Marinelli and L. F. Craver: "Treatment of Lymphosarcoma with Radioactive Phosphorus", *American Journal of Roentgenology*, Volume XLVII, February, 1942, page 217.

(6) B. V. A. Low-Beer, J. H. Lawrence and R. S. Stone: "Therapeutic Use of Radioactive Substances", *Radiology*, Volume XXXIX, November, 1942, page 573.
(6) D. Symmers: "Clinical Significance of the Pathological Changes in Giant Follicular Lymphadenopathy", *Archives of Pathology*, Volume XXXIV, August, 1942, page 385.
(7) E. A. Gall and T. B. Mallory: "Malignant Lymphoma", *The American Journal of Pathology*, Volume XVIII, May, 1942, page 381.
(8) R. A. Willis: "The Spread of Tumours in the Human Body", Monographs of the Baker Institute of Medical Research, Number 2, Chapter IV, 1934, page 56.

A USEFUL PUMP.

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REALIZING the advantages of direct transfusion of uncitrated blood, we attempted to make a pump similar to that devised by Dr. Julian Smith.(1) Probably through ignorance of the precise mechanical details of construction this pump was not satisfactory, because the rubber tubing had a tendency to become loose and to jump out of the instrument. We then tried a modified construction, and

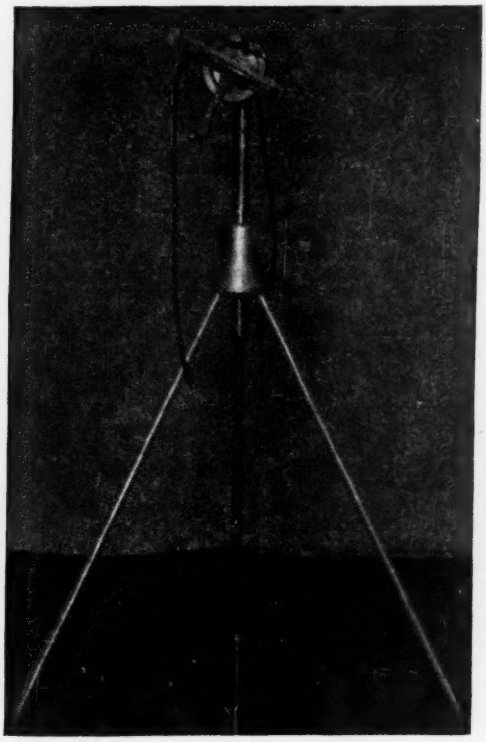

FIGURE I.

the pump illustrated was made for us by Mr. Theodore Falcon, of Salonika. So simple is the construction of this pump that the illustrations are self-explanatory.

This pump has the following advantages. It stands on the floor and the height is adjustable. The base can be removed and the tripod legs unscrewed for transport. The tubing runs, unlike that of the Smith pump, around the outside of the drum and is prevented from creeping through during operation and from working loose by a small collar of metal tubing fitted with a flange, through which the rubber tubing passes. The rollers have screw adjustment, and by means of an assortment of collars tubing of any size or type can be used. The tubing, with collar fitted, requires only sterilization, and it can be fitted on the machine without touching the ends to which the needles are attached. A number of lengths of tubing fitted with collars and with needles attached and protected

FIGURE II.

with test tubes may be kept ready sterilized. The diameter of the drum is four and a half inches. With standard transfusion tubing one revolution of the handle delivers 1·35 millilitres of blood. That is to say, 400 turns of the handle empty or fill an army transfusion bottle, and this can be done in three minutes or less if necessary. The strong and simple construction leaves little to get out of order. Short lengths of tubing can be employed.

FIGURE III.

This pump can be utilized for the following purposes: (i) direct blood transfusion; (ii) the rapid taking of blood from donors; (iii) the delivering of stored blood or other solutions from bottles, especially when it is desired to run them in at a more rapid rate than can be obtained from gravity; measured amounts can be administered intermittently by giving the handle a specified number of turns at specified intervals; (iv) aspiration of the thorax, liver abscesses *et cetera*; (v) suction during operations. A more gentle and continuous suction can be obtained with

this pump than with other portable suction apparatuses like the reversed tire foot pump. Brain or bowel is not sucked forcibly against the nozzle; but powerful suction can be obtained by vigorous turning and the use of wide, thick, stiff tubing.

Reference.

(1) J. Smith: "Transfusion by Direct Methods", THE MEDICAL JOURNAL OF AUSTRALIA, Volume II, 1942, page 92.

A CASE OF CONGENITAL AFIBRINOGENÆMIA.

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AMONG the rarer causes of the so-called hæmorrhagic diathesis is a deficiency of or even complete absence of blood fibrinogen. This deficiency may be present from birth or it may be acquired later in life. The general term "fibrinogenopenia" or "fibrinopenia" is applied to all such cases. The term "congenital afibrinogenæmia" is applied to the rare congenital form with complete absence of fibrinogen, and the term "hypofibrinogenæmia" to the still rarer form in which the blood fibrinogen content is subnormal.

The congenital form of fibrinopenia is a rare cause of a hæmorrhagic tendency in early life. Only seven cases of congenital afibrinogenæmia have been reported.[1][2][3][4][5][6] However, this form is probably more common than is realized, since there is a tendency to label congenital "bleeders" of the male sex as "hæmophiliacs" without excluding other possible causes for their condition. In addition, it is probable that a large proportion of patients suffering from the congenital form succumb to umbilical hæmorrhage in the neonatal period without a diagnosis being made.

Acquired Fibrinopenia.

The acquired form of fibrinopenia is caused by some toxic or neoplastic interference with fibrinogen formation, and it is sometimes of a transitory nature. Numerous examples have been published, and in several complete absence of fibrinogen from the blood has been noted.

Opitz and Silberberg (1924) found absence of blood fibrinogen in a girl, aged three years, with gross tuberculous involvement of the liver. Jurgens and Trautwein (1930) found less than 0·1 gramme of fibrinogen *per centum*, with no clotting in forty-eight hours, in the blood of a patient, aged fifty-two years, who had widespread metastases in bone marrow from a prostatic carcinoma. Allibone and Baar (1943) reported temporary afibrinogenæmia in an infant with congenital obliteration of the bile ducts. Knauer (1927) reported the case of a girl, aged six years, with *purpura fulminans*, whose blood had a fibrinogen content of 0·015 gramme *per centum* and showed no signs of clotting in three days. Glanzmann, Steiner and Kellner (1940) reported the case of a female infant, aged eight months, with a transitory hæmorrhagic diathesis associated with hæmolytic anæmia, and with temporary afibrinogenæmia. These cases of severe acquired fibrinogenopenia throw some light on the site of fibrinogen formation and suggest that both the liver and bone marrow are concerned with this function.

Congenital Afibrinogenæmia.

In congenital afibrinogenæmia the hæmorrhagic tendency is apparent from the early days of life. It is probably caused by an hereditary defect of fibrinogen formation. In two of the seven reported cases there was evidence of a hæmorrhagic diathesis in relatives. Each patient was a male, and each had a sister who was affected. The parents in both these cases were first cousins. In another of the seven cases the parents were also first cousins. Both sexes were affected. No fibrinogen was detectable in the blood in any of these cases.

It is generally agreed that the blood fibrinogen concentration determines in great part the erythrocyte sedimentation rate. In those cases in which the result of the test was reported, the erythrocyte sedimentation rate was very low, lending support to this view. The blood is incoagulable. The bleeding time varies widely, but is usually prolonged.

Intermittent thrombocytopenia was observed in two of the seven cases.

The prognosis is poor. Four of the seven patients died in childhood, and the other three had not passed beyond that period of life at the time when the report was published. In two cases a sister died of umbilical hæmorrhage. The frequent slight traumata of childhood constitute an ever-present threat of death to these unfortunate children.

The treatment of the hæmorrhages is decided by their severity. When these are trivial, conservative treatment by rest and sedatives is indicated. When the hæmorrhage is severe or persistent, a transfusion of fresh blood is the treatment of choice. Fresh blood supplies the fibrinogen needed by the patient. In the case reported below an intramuscular injection of fresh citrated blood was followed by cessation of bleeding.

Congenital Hypofibrinogenæmia.

In addition to the reported cases of congenital afibrinogenæmia in which fibrinogen is absent from the blood, four cases have been reported of congenital hypofibrinogenæmia in which the fibrinogen concentration was subnormal (0·018 gramme *per centum*; normal range, 0·2 to 0·4 gramme *per centum*). There was a family history of hæmorrhagic tendency in three cases. All the subjects were "bleeders" for most of their lives. Both the clotting and bleeding times were normal. The erythrocyte sedimentation rate was normal or moderately raised, which is surprising. (This tendency in the sedimentation rate is directly opposite to the changes observed in the case reported below and also to the experiences of Macfarlane.[6]) The prognosis appears to be better, as the patients were all adults, their ages ranging from twenty-two to seventy-one years.

Clinical Record.

The patient was a male infant. The confinement was normal and the birth weight was six pounds seven ounces. No family history of hæmorrhagic tendency was elicited from the mother. Investigation of the paternal family history was not possible, as the father had deserted the mother during her pregnancy.

Hæmorrhage from the infant's umbilicus commenced forty-eight hours after birth. In spite of intensive vitamin *K* therapy the hæmorrhage persisted. When the baby was seven days old, Dr. Ethel Byrne examined him in the course of securing a blood specimen for the Wassermann test prior to the making of arrangements for adoption. She noticed that blood oozed freely from a needle prick, and also that the blood specimen was unclotted after thirty minutes and that after four hours serum was obtained after centrifugation. At this stage a blood count gave the following information. The hæmoglobin value was 71% (9·9 grammes *per centum*) and the red blood cells numbered 3,480,000 per cubic millimetre.

The baby was admitted to the Newcastle Hospital at this stage (November 26, 1945); he was eight days old. He was pale and blood still oozed from the umbilicus. No hæmorrhage was occurring from any other site. The child now weighed five pounds three ounces. A blood count gave the following information. The hæmoglobin value was 45% (6·3 grammes *per centum*); the red blood cells numbered 2,900,000 per cubic millimetre, and the white blood cells 11,500 per cubic millimetre; the platelets were of normal distribution in the blood film. When the coagulation time was tested, no clot had formed in three and a half hours; investigation of the bleeding time showed that a needle prick still oozed after half an hour. The intramuscular administration of "Hæmoplastin" and the local application of silver nitrate to the umbilicus were instituted without effect. Three days after the child's admission to Newcastle Hospital, 20 millilitres of fresh citrated blood were injected into the buttocks. Oozing ceased within twelve hours. Fourteen days after his

admission to the hospital (December 11) a blood count gave the following information. The hæmoglobin value was 49% (6·9 grammes *per centum*); the red blood cells numbered 4,360,000 per cubic millimetre and the white blood cells 6,050 per cubic millimetre; platelets numbered 519,000 per cubic millimetre. The erythrocyte sedimentation rate was two and a half millimetres after two and a half hours (normal, seven to ten millimetres in one hour). The bleeding time was still prolonged and no coagulation had occurred after sixteen hours. No further spontaneous oozing occurred. At eleven and a half weeks (February 6, 1946) the baby weighed seven pounds eleven ounces. A blood count now gave the following information. The red blood cells numbered 4,370,000 per cubic millimetre and the hæmoglobin value was 52% (7·3 grammes *per centum*). The bleeding time was two and a half minutes. On April 15 a further blood count gave the following information. The red blood cells numbered 4,000,000 per cubic millimetre and the hæmoglobin value was 50% (7·0 grammes *per centum*). No coagulation had occurred in seven days. The infant was discharged on May 8 to the care of a foundlings' home. He was now twenty-two weeks old and his weight was eight pounds fifteen ounces.

Investigations.

It became apparent shortly after the baby's admission to hospital that the hæmorrhage was unlikely to be due to the usual causes of neonatal hæmorrhage — namely, deficiency of blood prothrombin, hæmophilia and purpura. There was no clinical evidence of liver damage, and yet intensive vitamin *K* therapy had been ineffective in stemming the hæmorrhage. The blood was apparently incoagulable. There were no clinical signs of purpura, the coagulation time was prolonged, and the distribution of platelets in a blood film appeared normal. The response to the intramuscular injection of fresh citrated blood was at least suggestive that some factor necessary for coagulation, while absent from the baby's blood, could be supplied in fresh normal blood.

The commonly accepted view of the mechanism of blood coagulation is that prothrombin gives rise to thrombin, which in turn actuates fibrinogen to produce fibrin, the basis of the clot. Fibrinogen and prothrombin are normal blood proteins and are produced mainly in the liver. Vitamin *K* is vitally connected with the formation of prothrombin. The change of prothrombin to thrombin is ordinarily induced by thromboplastin from the tissue juices and blood platelets. Calcium must be present. The double enzyme reaction is as follows: Step I: prothrombin + (calcium and thromboplastin) = thrombin; Step II: fibrinogen + (thrombin) = fibrin.

To determine at which stage the baby's clotting mechanism was deficient, the following experiments were performed.

Experiment I: To a sample of the baby's blood a suitable quantity of calcium chloride solution was added. No clot formed.

Experiment II: To a similar sample thromboplastin solution was added. No clot formed.

Experiment III: (*a*) To a similar sample thromboplastin solution was added and the mixture was allowed to stand for about one hour. A suitable quantity of potassium oxalate solution was then added, followed by fresh normal citrated plasma. A clot formed. (*b*) A sample of the baby's blood was oxalated, thromboplastin solution and fresh normal plasma were added. No clot formed.

Experiment IV: (*a*) Samples of normal serum and of normal fresh citrated plasma were mixed. A clot formed. (*b*) Samples of the same serum and the baby's fresh oxalated blood were mixed. No clot formed.

Experiment V: To a sample of the baby's fresh oxalated blood thrombin solution was added. No clot formed.

Experiment VI: To a sample of the baby's blood, which had been allowed to stand for about one hour, a sample of purified fibrinogen solution was added. A clot formed rapidly.

Comment.

Experiments I and II were devised to exclude the possibility of deficiency of thromboplastin or calcium ions. Experiment III indicates that Step I of the clotting mechanism proceeds normally. Thrombin is formed and converts the plasma fibrinogen to fibrin (Experiment III (*a*)). Where Step I is inhibited by oxalating the baby's blood immediately, the non-production of thrombin is reflected in the absence of clotting on the addition of plasma (Experiment III (*b*)). Experiment IV indicates that the baby is deficient in fibrinogen. The excess thrombin present in the serum of freshly clotted blood was able to convert the plasma fibrinogen to fibrin (Experiment IV (*a*)). The addition of the same serum to the baby's fresh oxalated blood results in no fibrin clot (Experiment IV (*b*)). The inference is that fibrinogen is either absent or below the critical level for Step II to occur. Experiment V confirms the observation in Experiment III—namely, that it is not the deficiency of thrombin that is inhibiting clotting. Experiment VI confirms the result of Experiment IV—namely, that the baby's blood is deficient in fibrinogen.

The fibrinogen solutions were prepared by the methods adopted by Neurath, Dees and Fox.[7] The thrombin was prepared from freshly oxalated plasma by diluting it one in ten with water and adding a 1% solution of acetic acid to adjust the pH to 5·3. The treated plasma was centrifuged and the supernatant fluid poured off. The moistened precipitate was allowed to stand until the prothrombin was converted to thrombin (twenty-four hours or longer). This can be tested for by adding the precipitate to freshly oxalated plasma. The precipitate may be dried by means of acetone.

Owing to the difficulty in obtaining a large blood sample, no determination of the blood fibrinogen content was possible; but the incoagulability of the baby's blood in the light of the foregoing observations indicates that the condition is congenital afibrinogenæmia.

Summary.

1. The term fibrinogenopenia is defined. The congenital and acquired forms are briefly discussed.
2. A case of congenital afibrinogenæmia in a newborn baby is reported.

Acknowledgements.

I wish to thank Dr. Ethel Byrne for her permission to report this case.

References.

(1) F. Rabe and E. Salomon: *"Ueber Faserstoffmangel im Blute bei einem Falle von Hämophilie", Deutsches Archiv für klinische Medizin*, Volume CXXXII, 1920, page 240.
(2) H. Opitz and M. Frei: *"Ueber eine neue Form der Pseudohämophilie", Jahrbuch für Kinderheilkunde und physische Erziehung*, Volume XCIV, 1921, page 374.
(3) R. G. Macfarlane: "A Boy with No Fibrinogen", *The Lancet*, Volume I, February 5, 1938, page 309.
(4) G. Schönholzer: *"Die hereditäre Fibrinogenopenie", Deutsches Archiv für klinische Medizin*, Volume CLXXXIV, 1939, page 496.
(5) E. Glanzmann, H. Steiner and H. Keller: *"Konstitutionelle angeborene Afibrinogenämie und Fibrinopenie im Kindesalter", Schweizerische medizinische Wochenschrift*, Volume LXX, December 21, 1940, page 1243, and December 28, 1940, page 1261.
(6) J. L. Henderson, G. M. M. Donaldson and Harold Scarborough: "Congenital Afibrinogenæmia. Report of a Case with a Review of the Literature", *The Quarterly Journal of Medicine*, Volume XIV (New Series), April, 1945, page 101.
(7) H. Neurath, J. E. Dees and H. Fox: "Preparation and Properties of Human Fibrinogen Solutions", *The Journal of Urology*, Volume XLIX, April, 1943, page 497.

Reviews.

FOOD AND NUTRITION.

"FOOD AND NUTRITION", by E. W. H. Cruickshank, is one of the few books on the subject by a British author.[1] During the last ten to fifteen years a relatively large number of books on various phases of these subjects has poured from

[1] "Food and Nutrition: The Physiological Bases of Human Nutrition", by E. W. H. Cruickshank, M.D. (Aberdeen), D.Sc. (London), Ph.D. (Cantab.), M.R.C.P.; 1946. Edinburgh: E. and S. Livingstone Limited. 8½" × 5½", pp. 333, with illustrations. Price: 16s.

the publishing houses, mainly of the United States of America. Many earlier authors concentrated on the biochemical aspects, undoubtedly in response to the then new work on the chemistry of vitamins. In recent years more writers have extended the scope of their work and have devoted space to a consideration of the soil, to the production, distribution and marketing of food, as well as to the preparation, cooking and finally the utilization of food by man. A wide approach is surely the more realistic. The author of this work follows this line. As is to be expected, a high percentage of the examples are drawn from Great Britain, and particular reference is made to the results of the valuable large-scale nutritional experiments made in that country during the war.

The first four chapters deal with such general themes as the evolution of human dietaries, the problem of malnutrition, nutrition in Great Britain. These chapters give a good broad introduction to the subject and help to set it in its correct perspective. In selecting material, the author has made liberal use of the facts and ideals presented at the Hot Springs Conference.

Five chapters are devoted to energy requirements, protein, carbohydrate, fat, vitamins and minerals. The subject matter is presented clearly, without too much detail. For this reason the specialist in this field may find these chapters too brief for his purpose. But the author states that the book is intended for use by students for the Diploma of Public Health; for this purpose the subject is sufficiently and adequately covered.

There are a number of curious omissions and some unexpected errors in this section. Here are some examples: In the discussion on anæmia in pregnancy no reference is made to the recent work on physiological hydræmia and its relation to anæmia. In the same section, when reviewing the iron requirements of the infant, the author states that most of the iron of the newborn infant is stored in the liver, ignoring the recent work by some of his Scottish colleagues which has demonstrated that most of the iron in the newborn infant is in the red blood cells. The suggestion that the signs of myxœdema will disappear following the administration of potassium iodide cannot be substantiated. These five chapters are the weakest section of the book.

The next four chapters are devoted to foodstuffs, bread, milk, protein-rich foods and vegetables. The last subject is treated particularly well. As with other sections of the book the chapter on bread deals almost exclusively with the British experience. The author ignores the fact that bread is a different commodity both physically and chemically in the different countries of the world.

A chapter on dietary standards and dietary planning approaches the subject in a realistic manner and gives a sound interpretation to the various recommended dietary standards.

Additional chapters deal with the preservation of food, diet and dental caries and the appraisal of nutritional status. The last subject is covered in a general way, but unfortunately the author does not discuss the place and value of biochemical methods in the assessment of nutritional status. The final chapter is topical, for in it the author reviews the Food and Agriculture Organization of the United Nations and the contribution it can make to world food problems.

This book should prove very useful to both medical students and practitioners, for it approaches the subject on a broad basis and presents the problems of nutrition as they affect the daily lives of the well and the sick.

A CLINICAL SURGICAL HANDBOOK.

THE third edition of V. M. Coppleson's "Clinical Handbook for Residents, Nurses and Students" appears as a greatly altered and enlarged volume.[1]

A notable addition is the first chapter, of considerable length, which sets out quite clearly the routine management of patients undergoing surgical operations. This chapter deals with general surgery and aims at establishing a routine which the surgeon can direct to be followed as a whole without the irritation of his worrying over minor details. It is of necessity dogmatic and will therefore be bound to be subjected to criticism. A smaller, but actually the most helpful addition, is the section which deals with intestinal intubation and with water balance. Apart from the fact that the tables given are not very clear and do not balance with each other, this section is probably the most useful in the whole book. Other additions concern a number of special branches of surgery and the use of penicillin and the sulphonamides. The short section on the management of ward dressings and the rules for a ward dressing team is excellent and could with great advantage be followed by all hospitals.

It is felt that this book should be renamed. The notable deletions from the previous edition are medical and the book is now so frankly of surgical flavour that this should, in fairness to prospective purchasers, be conveyed in the title. Furthermore, it can no longer be maintained that this book is one for nurses. One of the principal faults that examiners of nurses for registration find, is that trainees are taught medicine and surgery instead of medical and surgical nursing. This is not a book for nurses, as they cannot be expected to sort out of it what they should really know.

It is unfortunate that for all the good work put into this book, one is left with the impression that the new edition has been brought out rather hastily. There is still present the lack of balance due to insufficient leadership by the author of his guest writers of special chapters. This has meant the appearance of widely different styles, which is not to the advantage of a reference work. It is disconcerting to find some subjects discussed by both the author and a guest writer with the result that two opinions are given which differ, not only in scope, but in actual substance.

Proofs have unfortunately not been read well and there is an abundance of errors of English expression and spelling. In some instances, figures are incorrect and confusing. American spelling unaccountably appears in places in a book which predominantly uses English spelling. Occasionally the reader feels the lack of more detail, and it is irritating to find that one is here and there referred to a journal. It is precisely in such a book as this that one expects to find full details.

Despite these criticisms, the book is an excellent addition to Australian surgical literature, and in this edition has advanced from being a small reference book for ward use to the status of a volume which could well be a standard possession of students and resident medical officers.

THE BACKGROUND OF INFECTIOUS DISEASES IN MAN.

IN 1945 the Melbourne Permanent Post-Graduate Committee and the New South Wales Post-Graduate Committee in Medicine, University of Sydney, requested Professor F. M. Burnet to deliver a series of lectures on the background of infectious disease. These are now published as a booklet of 109 pages, pleasantly printed, and arranged very much as they were presented, with a preliminary general chapter, and then consideration of five groups of diseases, each occupying one chapter.[1]

We have learned to expect from Professor Burnet a presentation of the broad view of the philosophical scientist, the detailed knowledge of the laboratory worker *plus* the practical attitude of the hygienist, and in this book these are once again blended in a thought-provoking manner.

The purpose of post-graduate medical study should be a dual one; to enable the practising doctor to assimilate advances in knowledge for his own fuller understanding of disease processes, as well as to use the practical aspects of those advances in the better treatment of his patients. So in this small booklet the student finds a discussion of the natural trends of infectious disease, the effects of treatment of patients and attempts at immunization of susceptibles, with due regard to the importance of subclinical infections in the reactions of the community at large to viral and bacterial pathogens. Poliomyelitis, rubella and infectious jaundice are considered, as are the respiratory virus diseases, and there is a useful chapter on streptococcal infections and rheumatic fever, with a discussion of preventive measures designed to control droplet and dust transmission of organisms, and a note on the possibilities of chemoprophylaxis.

The concluding chapter on the natural history of tuberculosis is most valuable and stimulating, and would amply repay careful attention from all who are concerned in the treatment of the disease and management of social conditions of the patients.

Rereading and quiet study of these lectures in print will benefit those who heard them delivered, even more than the reader meeting them for the first time.

[1] "Clinical Handbook for Residents, Nurses and Students", by V. M. Coppleson, M.B., Ch.M., F.R.C.S., F.R.A.C.S.; Third Edition; 1946. Sydney, London: Angus and Robertson Limited. 8¼" × 5¼", pp. 470. Price: 25s.

[1] "The Background of Infectious Diseases in Man", by F. M. Burnet, M.D., F.R.S.; 1946. Melbourne: The Melbourne Permanent Post-Graduate Committee. 7" × 4", pp. 118.

The Medical Journal of Australia

SATURDAY, JANUARY 25, 1947.

All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

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CHILD HEALTH AND WELFARE.

READERS of this journal are continually being reminded of the difficulties associated with the provision of an adequate health service for the children of the Commonwealth. In December last reference was made in these columns to the school medical services in the several States, to their accomplishments and to their needs and also to a conference of school medical officers held at Canberra earlier in the year. Shortly before that the problem of the pre-school child was discussed in the light of a book, "The Pre-School Child and Society", by John Bostock and Edna Hill. It was admitted that the problem of the pre-school child was one of medical, educational and social conditions; at the same time the problem was held to be bound up with the present disturbed state of society. Though these discussions dealt with children of special age groups, the statement about the disturbed state of society holds for both of them and indeed for problems associated with any other age groups in the community. As a corollary to what we may call our sectional discussions on problems of child welfare, it will be useful to consider investigations that have been reported from England into the whole subject of child health and welfare. The Pædiatric Committee of the Royal College of Physicians of London has published its final report on this subject.

The Pædiatric Committee was appointed by the College in October, 1943, with the following terms of reference: "To inquire into the education of undergraduates and post-graduates in the subject of Infant Hygiene and Diseases of Children; and to make recommendations covering this branch of medical practice in the future." The committee which comprised nineteen members had Lord Moran as its chairman and Sir Leonard Parsons as its vice-chairman. An interim report which was published in 1945 dealt with undergraduate and post-graduate education in pædiatrics. The final report deals with the second half of the terms of reference and contains suggestions for what is in effect a pædiatric service for the nation. Of course, the education of members of the medical profession in pædiatrics is inseparable from the running of a satisfactory service in pædiatrics. However, we do not propose to follow this report in detail, since it refers to conditions existing in England, but there is much in it that may be applied to Australia. The most important section of the report deals with preventive and curative pædiatrics. It is the old question of the gap between preventive and curative medicine. "The gap now existing between the preventive services provided by the local health authorities and the clinical services provided by practitioners and hospitals must be closed." The report goes on to state that the present policy of having two groups of medical personnel, the one engaged in preventive and the other in curative work, is good neither for the child nor for the doctor. To say that the gap in this country is less than it used to be is true; but this is not enough. The lessening of the gap means that there has been more cooperation than there used to be between the departmental medical officer on the one hand and the family doctor on the other. The cooperation varies in extent in different places. It can be brought about partly by organization and partly by training, but chiefly by the enthusiasm and willingness of the family practitioner. One of the most important factors in the organization of the present time is the personality of the departmental medical officer which either attracts and encourages the general practitioner or has exactly the opposite effect. The Pædiatric Committee holds that a long-term policy should aim at making the general practitioner primarily responsible for the medical care of the child in both the prevention and the treatment of disease, since he is the one best fitted to give this service in the home. It thinks that when health centres are established one or more doctors working at the centres should be specially interested and trained in child health. It recognizes the fact that every practitioner is not temperamentally suited to undertake advisory and educational work in pædiatrics. Since pædiatrics should deal not only with the individual child or adolescent in health and sickness, but also with his environment, whether at home, at school or at work, it thinks that in future there may be three kinds of practitioners undertaking this preventive work: (*a*) interested general practitioners with post-graduate experience who would act as medical officers at child welfare clinics, nurseries and schools; (*b*) hospital physicians who should give some of their time to preventive work in clinics, nurseries and schools; (*c*) whole-time medical officers employed by local authorities, the bulk of whose work would be preventive, but who would be attached to a hospital and should spend something like one-fifth of their time in preventive work. This means that, though in a long-range policy the general practitioner is to be made primarily responsible for the medical care of the child from the preventive and curative sides, only those "interested" general practitioners will undertake the preventive side. Presumably the general practitioner must be made to become "interested". This it is hoped will be done by departments of child health, established in connexion with universities. In general these university departments, some of which have recently been established, "comprise hospital beds and out-patient clinics, either in voluntary or local authority hospitals, together with preventive services such as welfare centres" often housed together with administrative offices in an

institute of child health. Whether such an idea would be acceptable in Australia is open to question, not only because two States have no faculties of medicine, but also because departments of child welfare are in being and are functioning as part of government departments. Naturally the question of chairs of pædiatrics in universities with medical schools will be raised. These have been established in connexion with several universities in Great Britain, and a proposal has been made for the establishment of such a chair in at least one Australian university. In this instance the proposal met with a mixed reception, some pressing warmly for the establishment of a chair and others holding that teaching in the basal sciences called for prior attention. It is beside the present point that both views could have and should have been met. We have also to remember that in more than one Australian medical school there are so far no chairs in medicine and surgery. It would appear that the part of the Pædiatric Committee's report dealing with departments of child health (the term "department" being applied solely to a university department) has only limited application to Australian conditions. On the other hand the recommendation that an advisory committee to the regional board should be appointed in England, might be adapted to such agencies as can be brought into relationship with one another in Australia. The idea in England is that a joint committee should be set up consisting of members of the university departments of child health, and the regional officers and local authority officers engaged in child health work. The committee would "act as an advisory body on all matters concerned with the health of children, and promote the linking of the hospital service provided by the regions with the functions and service provided in each major local authority". It would be the appropriate body to advise on all medical and scientific aspects of the care of children. This aspect of the question might with advantage be considered by the leaders of pædiatric practice in the several Australian States. If they thought desirable they might consider whether such a group as that comprising the school medical officers who met in conference some months ago at Canberra should not be approached so that views might be interchanged, even if no united body was formed. The Pædiatric Committee of the Royal College of Physicians has described the principal means of promoting child health and welfare in the following terms:

1. Assuring the availability of a satisfactory diet and optimum conditions in the domestic and social environment for the child from birth to adult life and for the mother before its birth and during her lactation.

2. Training medical practitioners so that they can advise about the hygiene and feeding of children and can recognize and treat abnormalities and disease in their early stages.

3. Training a sufficient number of nurses who can teach child care and nurse the sick child.

4. Educating parents and children with regard to personal health and family well-being.

5. Providing efficient services for the medical care and treatment of children in their homes, surgeries and health centres, hospitals, convalescent homes, day nurseries, hospital schools and all institutions providing residential accommodation for children.

All those who are interested in preventive and curative pædiatrics are unanimous that all is not being done that could be done; a renewed attempt to go forward should be made. In this attempt parents, doctors and the State must cooperate. The doctors should seize the opportunity and take the lead.

Current Comment.

RECENT STUDIES ON RECOVERY IN PNEUMOCOCCAL PNEUMONIA.

ALTHOUGH the sulphonamide drugs and penicillin are known to be effective in the treatment of pneumonia, the exact way in which they produce their beneficial effect is not clearly understood. The effect of chemotherapeutic agents such as the sulphonamides in the concentrations usually attained in the treatment of human beings is known to be bacteriostatic rather than bactericidal. Recovery from pneumonia and similar kinds of infection is generally thought of in terms of antibodies and phagocytes. W. Barry Wood, junior, who with different groups of fellow workers has been carrying out important researches on this subject,[1] points out in a first article with E. N. Irons that it is generally believed that the fully encapsuled pneumococcus cannot be attacked and destroyed by phagocytic cells unless it has previously been opsonized by type-specific antibodies. Wood and Irons point out that sulphonamide chemotherapy often brings about a crisis in pneumonia long before type-specific antibodies appear in the patient's serum. They have therefore studied the effect of sulphonamide chemotherapy upon the spreading pneumonic lesion. They examined the lungs of pneumonic rats that had been treated with sulphapyridine and had been sacrificed at various intervals after the start of treatment. During the first six to eighteen hours of treatment the drug had little effect on the organisms in the lesion. By the end of eighteen hours bacteriostasis was evident. Close examination of the pneumococci of the œdema zone of the advancing lesion showed that many of them were swollen, pleomorphic and irregularly stained. The pneumococci ceased to multiply and no further invasion of the surrounding alveoli took place. By forty-two hours the œdema zone had completely disappeared from the margin of the lesion and had been replaced by alveoli filled with phagocytic cells. Phagocytosis was seen only in the peripheral zone. The bacteriostatic action prevents the spread of the pneumonia and allows the alveolar phagocytic cells to overtake the pneumococci in the previously advancing portions of the lesion. In rats which were made leucopenic by the use of X rays the appearances described were more conspicuous because the number of cells was smaller in relation to the number of organisms. The time relations of the experiments described were compared with similar experiments in which type-specific antiserum was used. In these there was no time lag because the antibodies penetrated easily into the œdema fluid of the lobar consolidation. The phagocytic reaction was also observed in the lungs of animals with bacteriæmia, and this suggests to Wood and Irons that the phagocytosis occurs independently of circulating type-specific opsonins.

In a second paper in the same journal Wood with Charlotte McLeod and E. N. Irons reports an investigation of the factors influencing the phagocytosis of pneumococci in the lung during sulphonamide therapy. These authors refer to the commonly held view that pneumococci cannot be engulfed by phagocytic cells unless the surface of the capsule is altered by the presence of type-specific antibody (opsonin) or until the capsule itself is injured to such an extent that its antiphagocytic properties are destroyed. They point out that if phagocytosis in pneumonia is dependent on one of these two conditions, there are only three possible explanations for the phagocytic reaction shown in the pneumonic lungs of animals treated with sulphonamides: (i) The sulphonamide drug may injure the capsule of the pneumococcus either directly or indirectly and thus promote its phagocytosis. (ii) The phagocytic reaction may be brought about by the presence of natural or acquired opsonins in the animal's serum. (iii) A quantity of type-specific antibody sufficient to opsonize the pneumococci in the lung may accumulate locally in the pulmonary lesion, although no opsonin can be demonstrated in the

[1] *The Journal of Experimental Medicine*, October, 1946.

circulating blood at the time. Wood, McLeod and Irons prepared cultures of pneumococci in media containing varying concentrations of sulphapyridine; after varying periods of time the organisms were washed in fresh broth and were added in varying dilutions to the cells of rat blood—this was in order to study the influence of previous exposure to the drug on the process of phagocytosis *in vitro*. No phagocytosis could be demonstrated after this treatment of the organisms; therefore no effector interaction of the drug with the capsule of the organism could be invoked to explain the phenomena observed in the living animal. Attempts were made to show that the early formation of antibodies might be operative, but none could be shown in the rat before the third day. A variety of techniques were tried in an attempt to show small amounts of antibody in the lung tissue, but no convincing evidence could be obtained. The conclusion of this part of the investigation is that the destruction of pneumococci is brought about by a phagocytic mechanism that is independent of both opsonization and capsular injury.

The last paper in this series is by Wood with Mary R. Smith and Barbara Watson and deals with the mechanism of phagocytosis in the absence of antibody. These authors state that only Goodner and Miller, who wrote in 1935, have reported appreciable phagocytosis in the absence of antibody, and they expressed doubt about the significance of such phagocytosis, because the non-sensitized pneumococci appeared in their experiments to multiply within the phagocytes. Since the destruction of pneumococci has been shown by Wood and his fellow workers to be due neither to the presence of type-specific opsonins in the lungs nor to a direct effect of the drug on the capsule of the organism, Wood, Smith and Watson try to define the factors responsible. They point out that in spite of the evidence adduced in this series of investigations, it is still conceivable that phagocytic action in the living animal is dependent upon unknown factors which (*a*) are concentrated in the pneumonic exudate, (*b*) are brought to the alveoli by the circulating blood, or (*c*) are present in the living pulmonary tissue. Experiments (which need not be described) were undertaken and eliminated these possibilities. It was noted in some of these experiments, however, that phagocytosis occurred within the lumen of the large bronchi. In other words the alveoli were not the only site of phagocytosis. Further investigations suggested that a surface phenomenon might be operating in the ingestion of organisms by the cells, and this proved to be the case. Other tissues could be substituted for the bronchial mucosa; if suitable mixtures of cells and organisms were placed on the pleura, or the pericardium, or slices of cut liver, the process still went on, even if these tissues had been boiled first. Living preparations in the form of a hanging drop were also studied and to some of these antibody was added; a difference appeared between the two types of phagocytosis. The surface phenomenon seemed to be determined by the presence of organisms in a suitable relation to the leucocyte, pinned as it were between the phagocyte and the surface. In the hanging drop in which antibody was present phagocytosis was generally promoted.

The work of Wood and his collaborators which has been described breaks new ground. For workers in laboratories the conception of "surface phagocytosis" will be of the greatest importance. Wood, Smith and Watson hold that the failure of previous investigators to describe the phenomenon may be explained by the almost universal practice of carrying out phagocytic tests in the laboratory in glass test tubes or capillary pipettes or between the surfaces of glass cover slips. Surface phagocytosis depends upon the physical properties of the alveolar and bronchial surfaces; in the laboratory it occurs with relatively rough surfaces, such as filter paper and fibre glass. Apart from the important question of the recovery from pneumococcal pneumonia with which these studies are mainly concerned, Wood, Smith and Watson make some interesting observations on the normal individual. They point out that air-borne organisms frequently gain access to the lower respiratory tract, and that if it were not for the natural defence barriers in the lung, pneumonia would be an almost universal disease. The mechanisms of natural defence operating in the bronchi prevent most inspired bacteria from reaching the alveoli, but some organisms do get through. When these organisms enter the alveoli, they give rise to pneumonia unless they are taken away by phagocytes or destroyed by intracellular digestion. Wood, Smith and Watson hold that "surface phagocytosis" operates here and not the accumulation of antibody which would be far too slow. Further work on the lines of that carried out by these workers will be welcomed.

CHILBLAINS.

CERTAIN minor maladies which defy treatment are a perennial source of embarrassment to the earnest practitioner. His lay friends find great delight in their discussion on social occasions, especially if he maintains the desired state of glowering silence while they animatedly put forward their favourite remedies. Not the least of such maladies is the humble chilblain.

Albertine L. Winner and E. S. Cooper Willis have made a survey of chilblains among personnel of the Auxiliary Territorial Service based on analysis of over three thousand *questionnaires*.[1] The main ætiological findings may be detailed briefly. In this, generally speaking, healthy group of women, office workers had the highest incidence with the hands most affected. Officers were prominent in this group. Those who did much standing, especially cooks, had a lower incidence, but the feet were the commonest sites. Outdoor exposure had no apparent harmful effect. The most exposed group, the searchlight crews, had a particularly low incidence. There was a definite suggestion of a familial factor. The main aggravating factors stated were the use of a hot water bottle and sitting by the fire (24%), cold damp weather (19%) and cold dry weather (19%). The intriguing list of remedies used and reported in the *questionnaires* totals 78. Applications include whisky, snow, urine (a relic of magic according to the author), raw potato, roasted onion, and onion dipped in paraffin. Proprietary ointments have such excellent names as "Snowfire", "Chilipaste" and "Mystic". The favourite internal remedies are vitamin preparations and calcium, and we must not forget hay tea. Few will quarrel with the conclusion that none of the remedies listed can be considered specific. The thorough survey of the literature on the subject is a tribute to the industry and enthusiasm of the investigator, but leads to the melancholy conclusion that we know no more of the subject than we ever knew. Treatment advocated in the literature is diverse and original, including sympathectomy, paravertebral sympathetic block, the application of *Grenz* rays, induction of passive hyperæmia, the use of histamine and bee venom, the ingestion of vitamins *A* and *P*, and fluorescein. Calcium, originally prescribed because of (incorrect) low blood calcium findings, is regarded as useless. The variety and ingeniousness of the treatments found in the literature, second only to those in the Auxiliary Territorial Service *questionnaires*, justify the statement that a specific is not known. The only bright therapeutic spot in the paper is the mention of a widely distributed and popular ointment. Its composition was: phenol, 1 part; camphor, 6 parts; balsam of Peru, 2 parts; soft paraffin, 25 parts; hard paraffin, 7·5 parts; anhydrous lanoline to 100 parts. Directions were either to immerse the affected part in hot water, at bedtime, to dry it carefully and apply the ointment, or to rub the ointment in night and morning. Though not claimed to be a cure, this treatment is stated to have given widespread symptomatic relief.

Attention should be directed to a method of treatment reported in this journal in the issue of October 2, 1926, in which L. J. C. Mitchell described the application of pressure by rubber (sponge rubber and glove fingers). He was applying to chilblains the method described by F. Maclure for the treatment of chronic ulcer of the leg in which pressure by rubber was used (THE MEDICAL JOURNAL OF AUSTRALIA, January 9, 1926). Mitchell claimed that instant relief was given by this method, but no other authors appear to have followed up Mitchell's work.

[1] *The Lancet*, November 9, 1946.

Abstracts from Medical Literature.

RADIOLOGY.

Pulmonary Torulosis.

JOHN B. HAMILTON AND GILMAN R. TYLER (*Radiology*, August, 1946) state that pulmonary torulosis not infrequently manifests itself by producing pulmonary lesions, which in turn often antedate demonstrable involvement of the central nervous system. These pulmonary lesions are usually asymptomatic or nearly so; they may be found on routine radiological examination of the chest or mild symptoms may call attention to the pulmonary infection. In these cases X-ray findings far exceed those expected from the standpoint of symptomatology. The changes occurring in the lungs, as reported by others, may assume various appearances and are not characteristic of the disease, but usually suggest the possibility of tuberculosis. The lung lesion may precede by many months the onset of symptoms referable to the central nervous system and tend to regress when massive doses of potassium iodide are administered. The possibility of pulmonary torulosis should be borne in mind when there is a persistent asymptomatic or relatively asymptomatic parenchymal lesion which has inflammatory characteristics and which is resistant to diagnosis by ordinary laboratory procedures, especially if the patient is showing no evidence of a malignant neoplasm. The authors' experience suggests that penicillin, sulphathiazole and acriflavine have no value in the treatment of this condition.

The Mechanism of Action of Radiation on Tissues and its Application to the Treatment of Malignant Disease.

F. ELLIS (Editorial, *The British Journal of Radiology*, April, 1946) states that it is now possible to have a satisfactory hypothesis for the action of radiation on cells which correlates the results of experiments by various workers. It has been shown *in vitro* that much larger doses (of the order of 20,000r) are required to kill all the malignant cells than are apparently necessary in clinical work. This implies that the normal tissues and body fluids assist in destroying malignant cells which have not been destroyed by the radiation alone. Effects of radiation on cells have been studied *in vitro* and *in vivo*. Spear and his co-workers have shown that cells irradiated in tissue culture are sensitive in the premitotic phase. J. S. Mitchell has shown that as a result of radiation, ribose nucleotide accumulates in the cytoplasm of both normal and malignant cells irradiated clinically. This is apparently due to damage of an enzyme, which produces desoxyribose nucleotide from ribose nucleotide. It would seem that the phenomenon demonstrated by Mitchell is the reason for the premitotic sensitivity shown by Spear, since the chromosomes cannot grow if the supplies of suitable nucleotide are not produced. A third group of experiments has demonstrated that chromosomes are broken by radiation. They may remain broken or reunite in various ways. In addition chromosomes may suffer invisible damage as a result of irradiation. If one considers that the nucleus of the cell is chiefly responsible for the cell's activities and that specific parts of chromosomes are responsible for specific qualities of the cell, which is the accepted view of geneticists today, then it becomes obvious that such disturbances of the chromosomes must seriously affect the life of the cell, and may sooner or later result in the death of the cell. It might be that in certain types of cell, for example, nerve cells, mitosis never occurs, so that the effects of radiation on such tissues may manifest themselves only by the effects on the endothelial cells lining blood vessels and on other stromal tissues. Applying the results of the experimental work to practical therapy, one may conclude that the maximum dose possible should be given to the cells so as to produce the maximum number of chromosome breaks compatible with the survival of normal tissues.

Eosinophilic Granuloma of Bone.

C. C. DUNDON, H. A. WILLIAMS AND T. C. LAIPPLY (*Radiology*, November, 1946) state that the cause of eosinophilic granuloma is as yet unknown. At the present time most authors consider the lesion to be of inflammatory type, but a causative organism has not been demonstrated. In the great majority of instances the lesions are confined to bone. The osseous lesions are usually solitary and involve the bones of the skull or pelvis, the vertebræ, ribs and long bones. Multiple lesions are, however, not uncommon. Local and systemic signs and symptoms of slight to moderate degree are present in most instances. X-ray examination reveals a round, oval or irregularly shaped area of decreased density sharply demarcated from adjacent normal bone. The lesions usually vary from 1·0 to 4·0 centimetres in diameter. There is no osteoporosis of surrounding bone. Sclerosis of the margins of the lesion has been mentioned. The lesions apparently originate in the medullary portion of the bone. As the lesion grows, the cortex may be decreased in thickness, sometimes perforated, occasionally expanded. Spontaneous pathological fractures may result at the site of the granuloma. Because the X-ray appearance of eosinophilic granuloma may be indistinguishable from other inflammatory lesions, multiple myeloma or metastatic tumour, a biopsy is usually indicated.

The Therapeutic Approach in Mediastinal Tumour.

T. LEUCUTIA (Editorial, *American Journal of Roentgenology*, June, 1946) discusses the value of the X-ray therapeutic test dose in the diagnosis and treatment of mediastinal tumours. He states that the most efficient method of dealing with these tumours is to institute X-ray therapy at the earliest possible moment as a primary measure; and this is to be preferred to a policy of watchful waiting with serial skiagrams or surgical intervention as a first measure. In the posterior mediastinum the most common tumour is ganglioneuroma, and in the anterior mediastinum, lymphosarcoma, the mediastinal manifestations of leuchæmia, Hodgkin's disease, thymoma, carcinoma or sarcoma of thymic or thyreoid origin, teratoma, benign tumours, and pseudo-tumours such as aneurysm, hydatid cyst and encysted fluid. The great majority of these are extremely to moderately radio-sensitive and only 10% fail to give an irradiation response of some degree. The therapeutic test dose consists of the administration of the maximum amount of radiation that can safely be tolerated by the normal structures of the chest. Serial X-ray films are then taken at two weeks, six weeks, three months afterwards and so on. Some of the tumours melt away within two to three weeks. In other cases there is a 50% or more regression within six weeks, and complete disappearance occurs after a second course of irradiation. The first group includes lymphosarcoma and leuchæmia, and the second group chiefly Hodgkin's disease. A third group which includes most of the remaining malignant tumours, such as fibrosarcoma, melanoma, carcinoma of the thymus, teratoma *et cetera*, shows partial regression with increase again later. In a fourth group no change in size occurs after irradiation, and this includes all the benign tumours. This is the only group in which a radical excision may lead to a permanent cure. Thus if the tumour fails to respond within four to six weeks, surgical exploration is undertaken. The immediate administration of a therapeutic test dose of X-ray therapy in mediastinal tumours permits a satisfactory differential diagnosis in most instances.

The Diagnosis of Pancreatic Cyst.

JOHN F. HOLT (*Radiology*, April, 1946) states that a complete examination of the gastro-intestinal tract by X-ray methods is always indicated in the case of patients with suspected pancreatic cyst. The X-ray appearance varies according to the region of the pancreas from which the cyst arises and is largely dependent upon the size of the cyst and its position in relation to the abdominal viscera. On occasion, the outline of a pancreatic cyst may be clearly visible in a skiagram of the abdomen, but its presence is more frequently revealed by the extrinsic pressure defects which it produces. Calcium deposits rarely outline the cyst wall. As a rule, a cyst arising in the head of the pancreas produces widening of the duodenal loop with little or no deformity of the stomach, whereas a cyst of the body of the pancreas displaces the stomach anteriorly and superiorly, with variable distortion of the proximal loops of small bowel. Occasionally the cyst presents more superiorly and medially, resulting in a sweeping indentation of the lesser curvature. None of these findings is particularly diagnostic of cyst to the exclusion of neoplasm. A cyst arising from the tail of the pancreas very frequently produces a smoothly rounded indentation in the greater curvature of the stomach at or just above its mid-portion. A lateral view shows a more generalized indentation of the posterior gastric wall with associated anterior displacement of the entire stomach. The duodeno-jejunal flexure is displaced downward and the splenic flexure of the colon may be either indented along its medial aspect or displaced caudally. The greater curvature indentation may show postural variations, but usually is best demonstrated with the patient in a prone, right anterior oblique position. Although the defect is not demonstrable in all patients having a cyst arising from the tail of the pancreas, it occurs often enough to warrant more emphasis than it has been accorded in the past. Conceivably, an enlarged spleen, splenic

cyst, mesenteric cyst, omental cyst or retroperitoneal neoplasm might very well produce a similar localized indentation of the mid-portion of the greater gastric curvature, but such has not been the author's experience.

Reticulo-Endotheliosis.

ALLISON E. IMLER (*American Journal of Roentgenology*, September, 1946) states that the separation of Hand-Schüller-Christian's disease, eosinophilic granuloma or solitary granuloma of bone and Letterer-Siew's disease into specific disease entities is not valid on the basis of the evidence at hand. There are insufficient data to support the claim of a lipoid metabolic disorder as the primary causative factor. There are no pathological or radiological findings that warrant the classification of these syndromes as individual diseases. It is felt that all these processes are variants of a hyperplastic reaction of the reticulo-endothelial system and can be properly grouped under the term reticulo-endotheliosis. Eosinophilic granuloma or solitary granuloma of bone represents a localized or focal hyperplasia of the reticulo-endothelial system. The stage of the disease process in the hypophysis and *tuber cinereum* will determine the response of the *diabetes insipidus* to X-ray therapy. Little or no improvement will occur if the infiltration is in the stage of fibrosis. The pulmonary pathological change is comparable to that found in the bones which, in its early stages, is a granulomatous process and in the healing phase is almost entirely fibrosis. Pulmonary involvement in the early phase responds to deep X-ray therapy, but lesions that have gone on to fibrosis show very little change. Satisfactory response of the bone, pituitary and pulmonary lesions can be obtained with relatively small doses of X radiation.

The Significance of Minor Bone Injuries.

H. W. GILLESPIE (*The British Journal of Radiology*, May, 1946) recalls that in fractures, injury to the ligaments and muscles is often equal in importance to the bone damage and emphasizes the necessity to view the fracture as part of a complex injury and not solely as trauma to bone. In many cases of minor fracture it is evident that the importance of the damage to the soft tissue actually outweighs the bone injury, and anybody who has been in touch with medical problems of sport, such as injuries due to boxing, skiing or football, will know that torn ligaments may prove far more incapacitating than a straightforward fracture. Ordinarily X-ray reports on certain bone injuries may be amplified simply by inferring from the type and site of fracture which actual ligament has been damaged, and whether the ligamentous lesion is of greater consequence than the trivial bone trauma shown on the film. These fractures are commonly described as chip fractures or detachments of a small bone flake. The indirect diagnosis of "damaged ligament" rests on the fact that when the bone attachment of a ligament has undergone a strain, it rarely happens that the ligament is stripped off at the insertion, but that the ligamentous fibres are so firmly rooted in the bone that invariably a small bone fragment is avulsed. The attachment of the ligament remains intact, but the bone is broken. Although, theoretically, the detachment of a bone chip may occur at any site in the skeletal system, there are certain more usual sites where a bone flake is indicative of a damaged capsule or ligament, and where it is unlikely that the appearances are caused by direct impact on the bone itself. The author describes the common sites for these bone injuries.

PHYSICAL THERAPY.

Radiation Treatment of Benign and Inflammatory Conditions.

HUGH HARE (*Radiology*, July, 1946) draws attention in an editorial to the importance of the radiation treatment of benign and inflammatory conditions. The number of benign conditions in which radiation can be of great value is increasing, and generally a small dosage only is necessary so that there are no deleterious effects from the treatment either early or late. Skin changes resulting from the treatment of non-malignant conditions should not follow dosage given at the present time. In fact the doses are so small they may be repeated several times without risk. The author gives the following list of conditions in which radiation may be used. Inflammatory conditions: (i) tuberculous lymphadenitis; (ii) acute lymphadenitis; (iii) naso-pharyngeal lymphoid hypertrophy; (iv) parotitis—(*a*) acute post-operative, (*b*) chronic suppurative parotitis; (v) enlarged mediastinal lymph nodes following various infections, especially whooping-cough; (vi) herpes—(*a*) zoster, (*b*) simplex; (vii) plantar warts. Benign tumours: (i) angiomata; (ii) cystic hygromata; (iii) giant-cell tumours of bone; (iv) fibroid uteri; (v) pituitary adenomata—(*a*) chromophile, (*b*) chromophobe, (*c*) basophile; (vi) xanthomatosis. Other conditions: (i) arthritis (Marie-Strümpell); (ii) bursitis; (iii) cystic synovitis; (iv) metrorrhagia (non-specific); (v) keloids. For adenitis, especially that of tuberculous origin, radiation has for some years been the method of choice. The disease heals more rapidly after irradiation than after other treatment and an unsightly scar is avoided. Recurrences are no more likely to take place following radiation than following surgery. Naso-pharyngeal lymphoid hypertrophy is well controlled by X-ray or radium treatment, preferably radium. Of seventy-six cases in which radium was used marked improvement was noted in forty-five, temporary improvement in thirteen and no improvement in eighteen. In chronic suppurative parotitis small doses of X rays cause gradual decrease in the size of glands and disappearance of suppuration. X-ray therapy is of great value in the Marie-Strümpell type of spondylitis. In the early cases in which the disease is limited to the sacro-iliac joints a good result may be expected in 60% to 80%; in moderately advanced cases a good result may be expected in 30% to 60%, and in the advanced cases in 15% to 30%. The chief result is relief of pain and prevention of deformity. More and more patients with bursitis and peritendinitis are being treated by small doses of X rays with gratifying results, especially those with acute bursitis of the shoulder joint. Relief may be obtained after one or two treatments, but occasionally five or six must be given. In 70% of cases, relief is obtained whether calcification is present or not. In a series of ten patients treated by X rays, after manipulation under anæsthesia had failed, seven were cured. The author concludes by stating that the field of radiation treatment in benign and inflammatory conditions is extending as more knowledge is gained of good results from mild doses of X rays.

Cancer of the Skin: Statistics.

H. J. ULLMANN (*Radiology*, March, 1946) presents a preliminary report on epitheliomata of the skin treated by him between June 1, 1921, and January 1, 1944. The lesions numbered 1,347; 1,269 were treated by irradiation and 78 by surgical methods. Of the patients subjected to irradiation, 443 were traced for periods varying from two to eighteen years. There were 25 recurrences, all being retreated. Of the 12 patients with recurrent lesions who were retreated, all who were followed for two years or more remained cured. Biopsies were carried out in 385 cases. The results indicated that it is usually impossible to differentiate clinically between basal cell, squamous cell and other types of skin cancer, and that the type of cell makes little difference to the results of treatment. The author concludes that in the recording of the results of treatment of non-melanotic cancer of the skin, all lesions should be designated epitheliomata (or cancers, type not determined) unless a biopsy has been made. Such cancers, though moderately advanced, respond well to adequate irradiation or to adequate surgical measures.

Results of the X-Ray Treatment of Leuchæmia.

B. P. WIDMANN (*American Journal of Roentgenology*, April, 1946) states that irradiation is a valuable palliative procedure. Improvement in health and strength, and very often restoration of an approximately normal efficiency, may be achieved in more than 50% of patients suitable for treatment. The life span is probably increased in a small percentage of cases, although estimations for statistical purposes may be misleading and should not be used as criteria of the value of irradiation. Each patient is an individual calling for special details in treatment and in interpretation of the results. Patients with very mild or so-called benign types of leuchæmia may carry on for years with little or no irradiation. Patients with the fulminating or so-called malignant types, with very marked lymph glandular or splenic enlargement and rapidly failing health and strength, usually show progressive involvement unless treatment is instituted. The blood count is a reliable criterion of the progress of the disease. Treatment should be withheld until the patient's symptoms require alleviation. In this series, many patients maintained an excellent status of well-being and apparent good health with leucocyte counts ranging from 50,000 to 100,000 per cubic millimetre. In these circumstances no irradiation was given unless there was evidence of general indisposition, pain (predominantly in the region of the spine or joints), or marked lymph glandular or splenic enlargement. The technical procedure should evolve from the smallest dose compatible with maintenance of a favourable clinical status rather than from reductions in the normal leucocyte level.

Bibliography of Scientific and Industrial Reports.[1]

THE RESULTS OF WAR-TIME RESEARCH.

During the war a great deal of research was carried out under the auspices of the Allied Governments. It has been decided to release for general use a large proportion of the results of this research, together with information taken from former enemy countries as a form of reparations. With this end in view, the United States Department of Commerce, through its Publication Board, is making a weekly issue of abstracts of reports in the form of a "Bibliography of Scientific and Industrial Reports". This bibliography is now being received in Australia, and relevant extracts are reproduced hereunder.

Copies of the original reports may be obtained in two ways: (a) Microfilm or photostat copies may be purchased from the United States through the Council for Scientific and Industrial Research Information Service. Those desiring to avail themselves of this service should send the Australian equivalent of the net quoted United States price to the Council for Scientific and Industrial Research Information Service, 425, St. Kilda Road, Melbourne, S.C.2, and quote the PB number, author's name, and the subject of the abstract. All other charges will be borne by the Council for Scientific and Industrial Research. (b) The following reports may be obtained in approved cases without cost on making application to the Secondary Industries Division of the Ministry of Post-War Reconstruction, Wentworth House, 203, Collins Street, Melbourne, C.1. Copies of these are available for reference in public libraries.

Further information on subjects covered in the reports and kindred subjects may be obtained by approaching the Council for Scientific and Industrial Research Information Service, the Secondary Industries Division of the Ministry of Post-War Reconstruction, or the Munitions Supply Laboratories (Technical Information Section), Maribyrnong, Victoria.

PB 20077. LOWELL, ALICE, *et alii*. A small visual comparator for the determination of plasma volume. No date. 16 pp. Price: Microfilm, 50c.; Photostat, $2.00.

The visual comparator described was developed to meet a possible wartime need. It offers a simple means of determining plasma volume with reasonable accuracy. The determination of plasma volume by measuring the difference in colour between serum samples taken before and ten minutes after the intravenous injection of a known amount of the blue dye T-1824 has been described by Noble and Gregersen. They showed valid results both in normal subjects and in patients in shock. This simplified technique forms the basis of procedure in this report. The validity of the method and its application to other types of patients were studied and confirmed. Determinations of plasma volume were made in a large series of patients and the results obtained with the visual comparator compared with those obtained from measurements of the same sera on a Bausch and Lomb spectrophotometer. A small visual comparator with permanent glass standards was designed for measuring the colour of the ten-minute sample. (The Hellige pocket comparator with prism attachment has been modified to meet the needs of this method.) A description of the apparatus is given together with experimental data and tables followed by a discussion.

PB 19284. ROESSLER, W. G., *et alii*. The nutrition of *Coccidioides immitis* in submerged culture. No date. 2 pp. Price: Microfilm, 50c.; Photostat, $1.00.

This report seems to be an abstract of a paper on this subject. "In order to obtain greater yields, to eliminate the hazard of working with dry spores, and to permit more accurate evaluation, culture techniques and media suitable for submerged growth were developed."

PB 19289. ROESSLER, W. G., AND BREWER, C. R. Nutritional studies with *Clostridium botulinum*, toxin types A and B. No date. 2 pp. Price: Microfilm, 50c.; Photostat, $1.00.

This report appears to be an abstract of a paper on this subject. "The nutritional requirements of *Clostridium botulinum*, toxin types A and B, for growth and toxin production were studied. Experiments were designed to test the effects, interrelationships and requirements of amino acids, vitamins, nucleic acid components and salts."

PB 19298. ROESSLER, W. G., *et alii*. Studies with *Coccidioides immitis*. I. Submerged growth in liquid media. March-August, 1945. 32 pp. Price: Microfilm, 50c.; Photostat, $3.00.

This report appears to be a copy of a manuscript prepared for publication in some journal in this field. The data on nutritional requirements of *Coccidioides immitis* submitted in this report describe the development of liquid media which have produced excellent yields of sporulated cultures. A liquid "synthetic" medium and a liquid "natural" medium have been developed for the submerged growth of cultures of *Coccidioides immitis*. Tables and photomicrographs are included.

PB 19299. ROESSLER, W. G., *et alii*. Studies with *Coccidioides immitis*. II. In-vitro effects of streptothricin and streptomycin. June-August, 1945. 13 pp. Price: Microfilm, 50c.; Photostat, $1.00.

This report appears to be a copy of a manuscript prepared for publication in some journal in this field. The data presented in this paper show the possible value of streptothricin in the treatment of coccidioidomycosis. In contrast, streptomycin shows no inhibition *in vitro*, in agreement with previous in-vivo experiments which indicate that streptomycin possesses no chemotherapeutic value for this disease. Streptothricin in concentrations greater than one unit per millilitre effectively inhibits the growth of *Coccidioides immitis* in liquid cultures. Inhibition is complete even over long periods of incubation when the media contain more than ten units per millilitre. No inhibition of growth of *Coccidioides immitis* is shown by streptomycin. Tables, photographs and photomicrographs are attached.

PB 19286. WAGNER, J. C., *et alii*. Psittacosis vaccines prepared from chick embryo tissues. No date. 2 pp. Price: Microfilm, 50c.; Photostat, $1.00.

This report appears to be an abstract of a paper on this subject. The purpose of this study was to develop a chick embryo tissue vaccine effective for immunization of animals against the 6BC strain of psittacosis. The results indicate that some protection against respiratory and intracerebral challenge can be obtained with killed virus preparations.

PB 16147. WALD, GEORGE, *et alii*. The sensitivity of the human eye to infra-red radiation. (U.S. War Department Engineer Board Project XRS 441.) July, 1945. 88 pp. Price: Microfilm, $1.00; Photostat, $6.00.

The purpose of the investigation was to obtain, for the engineering of military devices, basic data regarding human vision in the near infra-red, and thus present a basic contribution to the physiology of vision. The choice of topics investigated has been governed entirely by military needs, but little or no attempt is made to accomplish the direct application of the information to the design or testing of military equipment. This step must be carried out by those directly engaged in the development of such devices, each device for itself. Besides bringing together background knowledge and literature references, the authors present results as follows:

1. Experimental tests by the threshold method of Goodeve's infra-red luminosity function, applied here for foveal vision. Their results confirm the applicability of Goodeve's function.
2. Determination of the infra-red luminosity function for the periphery of the eye, both for itself and in relation to the foveal function.
3. By comparison between the visual transmissions of infra-red filters as determined first by the threshold method and then by brightness matching, it is established that concordant results as to luminosity and visual transmission are yielded by the two methods. This agreement extends the similar agreement which has generally been reported in the ordinary visible spectrum.
4. Distribution of infra-red sensitivity in the population.
5. Variation of source visibility with angular size, for both the fovea and the periphery, and the application of associated ideas to the reduced scale determination of visual ranges of infra-red sources.

Although the results involve no striking departures from previous partial knowledge and best guesses, they furnish a solid basis for prediction and design where none existed before. Moreover, the report itself should furnish a valuable introduction to the subject for workers who, although trained as scientists or engineers, are not versed in vision physiology. The report contains sixteen charts, nineteen tables and extensive bibliography.

PB 15423. CHASIS, HERBERT. Phosgene: Review of the literature on the effect of exposure in man and experimental animals. November, 1943; revised April, 1944. 74 pp. Price: Microfilm, $1.00; Photostat, $5.00.

The principal purpose of this review is to obtain specific information concerning the physiological disturbances in man so as to evaluate and recommend treatment of phosgene gassed patients. The symptomatology and clinical course of human phosgene intoxication are presented from data obtained in World War I and from 292 accidental poisonings

[1] Supplied by the Information Service of the Council for Scientific and Industrial Research.

reported since that time. The data obtained in man are kept separately from those obtained from the experimental animal. This work was done at New York University College of Medicine. Appendices cover casualty production and outline of therapy. There is a bibliography of 124 items.

PB 19300. JOHANSSON, KARL R., AND FERRIS, DEAN H. Photography of air-borne particles during bacteriological plating operations. September-November, 1945. 33 pp. Price: Microfilm, 50c.; Photostat, $3.00.

This report appears to be a copy of a manuscript prepared for publication in some journal in the bacteriological field. The danger in handling some of the highly infectious agents with commonly used laboratory methods is apparent as shown by this report. Tables appear in the report. Diagram and photographs are attached.

PB 6951. RANDALL, FRANCIS E., AND DAMON, ALBERT. Facial types among aviation cadets. A.A.F. A.T.S.C. Memo. Rept. EXP-M-49-695-15.) September, 1942. 13 pp. Price: Microfilm, 50s.; Photostat, $1.00.

This report contains a chart showing frequency distribution of nasion-menton dimension (root of nose to base of chin) of 1,453 subjects, measurements of the seven head types, facial index, and photographs of the seven type heads, all based on data presented in Memorandum Report No. EXP-M-695-4B, entitled: "Facial surveys of aviation cadets and other flying personnel", dated August 31, 1942, and Memorandum Report No. EXP-M-49-695-4, entitled: "Anthropometric facial survey at Wilberforce University", dated July 7, 1942.

PB 16151. SAVELY, HARVEY E., JUNIOR. Visual disturbances following simulated ascent in the low-pressure chamber. (A.A.F. A.T.S.C. Memo. Rept. EXP-M-49-696-1.) July, 1942. 16 pp. Price: Microfilm, 50c.; Photostat, $2.00.

The visual defects described as "blurring of vision" and "restriction of visual field" are effects produced by exposure to low pressure. They are probably manifestations of aeroembolism; however, the exact mechanism by which they are produced is not known. The appendices contain reports on the fourteen cases of visual disturbances.

PB 5157. SPEERT, HAROLD. Salt and water requirements in hot weather. (A.A.F. A.T.S.C. Memo. Report EXP-M-49-696-27.) November, 1942. 41 pp. Price: Microfilm, 50c.; Photostat, $3.00.

The purpose of this report is to examine some recommendations embodied in Report No. 3 from the Harvard Fatigue Laboratory entitled "The requirements of water and sodium chloride for the best performance of men working in hot climates", in the light of certain recommendations of the U.S. Army; to evaluate such recommendations on the basis of observations and experience at the Youngstown Sheet and Tube Company, Youngstown, Ohio; to estimate the water requirements of men in life rafts under emergency conditions at sea, and the average survival period without water at different seasons in various parts of the world. Experiments as conducted are described in detail in Appendices I, II, III and IV. Plotted diagrams, graphs and word maps showing number of days required for the average man to reach a water deficit of 10% of his body weight if he keeps shaded and remains quiet are included.

PB 19301. U.S. AND CANADA. JOINT COMMISSION. WAR DISEASE CONTROL STATION, GROSSE ISLE, P.Q. Rinderpest, the preparation of tissues and egg vaccines. February, 1944, to January, 1946. 236 pages. Price: Microfilm, $2.50; Photostat, $16.00.

This report contains sixteen typewritten papers describing the methods used and the results obtained in cultivating rinderpest virus on the chorio-allantoic membrane of the developing hen's egg. In so far as can be told from tests under experimental conditions, a vaccine was prepared which is satisfactory for use in protecting cattle against rinderpest. Tables, charts, diagrams, graphs and photographs are included.

PB 19096. U.S. WAR DEPARTMENT. MEDICAL CORPS. Medical Department soldier's handbook. (Tech. Manual 8-220.) 485 pp. Price: Microfilm, $5.00; Photostat, $33.00.

This technical manual gives a complete scheme of instruction which covers the many phases of training of the medical department soldier.

PB 19094. U.S. WAR DEPARTMENT. MEDICAL CORPS. Physical reconditioning. (Tech. Manual 8-292.) 1944. 292 pp. Price: Microfilm, $3.00; Photostat, $19.00.

This manual complete with instructions and diagrammatic drawings is to accelerate the return to military duty of convalescent patients or to provide for their return to civilian life in the highest possible degree of physical fitness.

PB 20562. U.S. WAR DEPARTMENT. QUARTERMASTER BOARD. Report of test of underwear, insect proof (DDT) QMB T-1331. (Project T-274.) January, 1944. 7 pp. Price: Microfilm, 50c.; Photostat, $1.00.

Tests were made at Camp Lee, Virginia, to determine whether the wearing of insect-proof (DDT) underwear causes dermatitis, skin irritation or allergies. Tests in which men wore insect-proof underwear and other men had patches of this insect-proof underwear attached to their arms were made. Procedure is described in detail. It was concluded by medical officers who examined the men before and after the tests that there was no significant difference in skin reactions of men wearing the insect-proof underwear and those wearing the regular issue of underwear without insect proofing.

PB 16788. HORNBERGER, W., AND KÖNIG, H. Explosive decompression to simulated altitude up to 56,000 feet. Effect on man. Partial report I. (A translation from the German.) September, 1941. 23 pp. Price: Microfilm, 50c.; Photostat, $2.00.

The main purpose of the experiments was the determination of the "time reserve" available for rescue measures. It determines the speed with which a "rescue descent" must be started and carried out. A simulated altitude of 56,000 feet was obtained and tolerated after sudden decompression of from 33,000 to 39,500 feet with oxygen supply. Serious physical effects of rapid and sudden decompression did not occur under these conditions. The anticipated difficulties of stratosphere flight are further reduced. The time to the loss of consciousness due to low oxygen pressure is short. It was determined for different altitudes up to 55,500 feet. Two technical safety measures are required: (i) oxygen breathing in flight zone, and (ii) provisions for automatic rescue descent. Tables and a chart are attached to the report.

PB 16786. LUTZ, W. Preliminary report, decompression-atelectasis: fundamentals, conditions of origin, influence on the possibilities of escape from high altitudes and protective measures. No date. 21 pp. Price: Microfilm, 50c.; Photostat, $2.00.

This document is a translation of a report from the Institute of Aviation Medicine in Munich, Germany. The changes of the lungs following decompression, obtained in simulated altitude flight, were studied by means of X-ray examinations. Mice and rabbits were the experimental animals. The experiments resulted in the following conclusions: (i) Total atelectasis is not reproducible with certainty. (ii) Atelectasis develops at an altitude above 16,000 metres (52,493 feet). (iii) Atelectasis is the more frequent and the more extended, the higher the altitude and the longer the duration of stay. (iv) Its occurrence or non-occurrence is independent of intraabdominal pressure, of body temperature, and of the kind of respiratory gases. (v) Atelectasis can develop while the animal is still alive and can be counteracted in case of quick descent through the continuing of natural respiration. (vi) It is evident that only the decompression protective suit which prevents the development of low pressure can be considered the ideal preventive and entirely suitable escape apparatus. Attached to the report are ten X-ray photographs showing the development of decompression atelectasis and a chart on the release from atelectasis.

DAVIS, MARION I. JEFF. Cutaneous reactions to BAL in humans. (Chemical Warfare Service. Medical Division. MD (EA) Memorandum Report 101.) Off. Pub. Bd., Report, PB 11444. 1943. 13 pp. Price: Microfilm, 50c.; Photostat, $1.00.

Of 61 cases in which Lewisite applications to the human skin were treated with one application of BAL eye solution, 11 cases showed some form of skin reaction. In all but 3 of 11 cases showing a cutaneous reaction at the BAL treated site, there was also a reaction at every skin site to which Lewisite had been applied. There was no skin reactions in 150 humans in whom Lewisite applications to three sites on the skin were treated with hydrogen peroxide alone. The BAL reactions were irritated by a mild antiseptic ointment, but responded slowly to the use of a bland lotion. Tables are appended.

DUMKE, PAUL R., *et alii*. The effect of the resistance of the gas mask canister on cardiac output in the resting subject. (Chemical Warfare Service, Edgewood Arsenal. Medical Division Report 3.) Off. Pub. Bd., Report, PB 9507. 1944. 7 pp. Price: Microfilm, 50c.; Photostat, $1.00.

The object of the work covered by this report was to determine the effect of the inspiratory resistance of the gas mask canister on the cardiac output as measured with the balistocardiograph subject. Addition of normal inspiratory resistance of the combat gas mask canister had no effect on cardiac output in the resting subject with normal respiration, but increasing resistance resulted in increase in cardiac output. No decrease in cardiac output occurred when breathing through the mask was noted. Consequently systematic circulatory changes are thought not to be responsible for headaches, weakness and dizziness while wearing the mask, but possibly circulatory abnormalities are the cause of intolerance to the gas mask during exercise.

British Medical Association News.

NOTICE.

THE General Secretary of the Federal Council of the British Medical Association in Australia has announced that the following medical practitioner has been released from full-time duty with His Majesty's Forces and has resumed civil practice as from the date mentioned:

Dr. John Rae, 143, Macquarie Street, Sydney (January 20, 1947).

Special Correspondence.

LONDON LETTER.

FROM OUR SPECIAL REPRESENTATIVE.

The Closed Shop.

To understand the significance of the struggle over "The Closed Shop" it is necessary to go back some eighty years. In 1868 the Trades Union Congress was formed by the voluntary association of a number of trade unions, with a total membership of a little over a hundred thousand. The main objects were to formulate the main policies of trade unionism and to consult with various bodies, including government departments, on topics affecting the lives of wage earners and salaried employees. Today the total number of trade unions in the United Kingdom is 765, of which 192, with a membership of six and a half million, are affiliated to the Trades Union Congress, and the remaining 573 unions, most of them small, with a membership of one and a half million, are not affiliated to the Trades Union Congress, though many are recognized by that body. It is to be noted that the Medical Practitioners Union is affiliated to the Trades Union Congress, while the National Association of Local Government Officers is non-affiliated. The British Medical Association is not a trade union, though it is recognized by the Government and by local associations as the negotiating body on behalf of the profession; it is also recognized by and is in liaison with the Trades Union Congress, and there is a Joint Committee of the British Medical Association and Trades Union Congress to discuss matters of common interest.

Not only has the Trades Union Congress increased its membership with the years, but since the advent of a socialist government its scope of action has increased and it is consulted by the Government on matters far outside the relations between master and man, such as foreign policy. The Trades Union Congress favours big unions, and these compete among themselves for new members, mainly by the absorption of smaller unions. Some of the unions limit their members to one calling; thus the National Union of Railwaymen is made up entirely of certain grades of railway workers, but the really big unions, like the Transport and General Workers, spread their net much wider and include workers in many grades and many types of work. This in itself is a source of weakness as what is important in one industry may be of indifference to another, both within the same union. There is a tendency then for groups to "bud off" and to form unions on their own. These are generally referred to as "splinter" or "breakaway" unions and are not viewed with favour by the Trades Union Congress.

With the repeal of the *Trades Disputes Act* a short time ago it became legal for local authorities to require membership of a trade union as a condition of appointment to any position they might advertise and a number of local authorities have passed resolutions to carry this out. Others have gone further and have ordered that all present members of their staffs who are not trade unionists must forthwith become so, on the pain of dismissal, so leading to the closed shop. In the United States of America the term "closed shop" means an agreement by which employers take on only members of one specified union in one industry or section of an industry. The Trades Union Congress has never adopted this policy, but advocated "the 100 per cent. principle" which gets the same result but by different means. Here the members of the Trades Union Congress affiliated unions refuse to work with men who are non-unionists or who belong to a union they do not recognize, such as a splinter or breakaway union. The means adopted are different, but the end is much the same in both the United States of America and the United Kingdom. The miners have announced that they intend to demand a closed shop in the American meaning of the phrase and the Government will have to take a hand then as they will be the employers.

It is generally agreed that negotiations are made easier when there is complete unionism on the side of the men. It is a different proposition if to attain this end a man is forced to belong to a certain union, and, as membership of a union is by election, a worker who has made himself unpopular may be debarred from earning his living. The Trades Union Congress is very chary of admitting new unions to affiliation, as it regards them as breakaway organizations from some established union. In addition affiliation with the Trades Union Congress means a political affiliation with the socialist party. To put it baldly, has a man to belong to and support the socialist party in order to work at his profession or trade?

In the services, doctors and nurses are regarded as non-combatants and are treated as such, but by force of circumstances they are in the forefront of this closed shop fight. Left to themselves, some fifty local authorities, with socialist majorities, called on the members of their staffs to join a trade union or be dismissed. The trouble came over what was a "trade union", and the Government refused to be drawn on the matter. On the medical side some local authorities accepted membership of a professional body such as the British Medical Association or the Royal College of Nursing; others asked for membership of a body like the National Association of Local Government Officers, which is unaffiliated with the Trades Union Congress, but is recognized by it, while some went the whole way and demanded membership of an affiliated trade union like the Medical Practitioners Union. The storm broke when Willesden Borough Council informed two doctors and some fifty nurses and midwives on its staff that they must join an affiliated trade union or be dismissed. The nursing staff immediately tossed their caps into the ring and eight nurses who had not been served with dismissal notices forthwith handed their resignations to the matron, with the request to use them, should the dismissal notices not be withdrawn. A public function was being held at the municipal hospital with the mayor presiding, and in the midst of the proceedings, at which Royalty was represented, two nurses got to their feet in the body of the hall and in unison demanded an apology from the mayor for the action of his council; the mayor said nothing, but the papers did. The nurses appealed to the Royal College of Nursing and the doctors to the British Medical Association and both bodies promised moral and financial support. Letters of protest appeared in all the papers, one from some forty doctors practising in the borough of Willesden and another from the chairman of the Nursing Recruitment Committee, which is sponsored by the Government. *The Times* in a subleader waxed indignant at the "tactless and heavy-handed" action of the Willesden Borough Council, pointing out that the nursing staff had it in their power to close down the hospital completely and immediately. "The Government are officially neutral on the general issue of the closed shop, but Mr. Bevan cannot afford to be neutral in the case of the hospital service. The sooner he dissociates himself unmistakably from the blundering of the councillers in Willesden and elsewhere the better the prospects of promoting the harmonious development of the new national hospital service."

A hurriedly called meeting of the Willesden Borough Council withdrew the offending notices, not without opposition among its members, and the position eased. In the House of Commons the Minister of Health said that he had issued a circular to local authorities pointing out that their primary duty as health authorities was to maintain the efficiency and smooth running of their health services. "While I am anxious that doctors, nurses and members of similar professions should join a trade union or appropriate professional organization, this is a matter which should not be determined by unilateral action of local authority." This wording lets in the Royal College of Nursing and the British Medical Association. The Minister of Labour was also brought into action, for Willesden had served a dismissal notice on three Plymouth Brethren who have conscientious objections to joining any trade union. That such a threat is not an idle one is shown by the case of a Plymouth Brother, the one non-unionist in over 500 workmen, at a big power plant in London who was forced to leave his job in order to avert a strike which would have paralysed a large part of the underground railway. Mr. Isaacs replied, "he hoped that trade unions would respect religious opinions sincerely held". The piquancy of the situation is that a leading member of the Cabinet was a conscientious objector to military service when of military age. It would seem that in this matter of the closed shop "the female of the species is more deadly than the male", for the National Association

of Women Civil Servants is up in arms on the grounds that "monopoly rights in the trade union field substitute dictatorship for democracy". In a northern city the school teachers, mainly women, are in conflict with their local authority over the same point. The Willesden nurses will no doubt now cease to be front page news, but their action will be long remembered, as it drew statements which were badly needed and which had been carefully avoided from two responsible Ministers. Mr. Bevan and Mr. Isaacs must be wishing fervently to be delivered from their friends. "The whole episode is a valuable example of the efficacy of public opinion, promptly focused, when individual rights are outraged as in this case."

Correspondence.

POST-OPERATIVE TREATMENT OF RUPTURED APPENDIX.

SIR: Having read Dr. V. J. Kinsella's articles on post-operative treatment of appendicitis, I should like to give a brief account of an Air Force patient of mine who was treated on Dr. Kinsella's lines.

The patient presented with a history indicative of appendicitis, of forty-eight hours' duration. At operation he was found to have a ruptured, gangrenous appendix and a gangrenous caecum; the appendix was tensely adherent to the posterior caecal wall. The area was washed with saline solution and the abdomen was closed with drainage, the appendix being left *in situ*; 27,000 pints of gas-gangrene antitoxin were given. Penicillin and sulphamerazine therapy was instituted. He was given fluid only for eight days. A fæcal fistula developed, which closed after eight days. His diet was then gradually increased; he was given bread and butter, "Sao" biscuits, egg and fish. His temperature settled down after eight days. From the thirteenth to the sixteenth day he received half an ounce of paraffin at night. His bowels had not acted up till the seventeenth day, when he was given a glycerin enema with a good result. His diet was gradually increased, and he has made an uninterrupted recovery, his bowels acting normally since the enema.

I wish to thank the Director-General of Medical Services, Royal Australian Air Force, for permission to report this case.

Yours, etc.,
N. M. KATER.

Royal Australian Air Force Station,
Darwin,
Northern Territory.
November 26, 1946.

EARLY AMBULATION.

SIR: So much has been written recently of early ambulation that one wonders whether tissue repair has kept pace with the enthusiasm of the modern surgeon.

Should it have done so one must become reconciled to the melancholy spectacle of a patient, entering an exclusive nursing home, meeting himself emerging after the temporary cure of a thrice recurrent hernia—or something.

Yours, etc.,
JOHN BROUGHTON.

1A, Clairveaux Road,
Vaucluse,
New South Wales.
January 11, 1947.

THE ZOOLOGICAL POSITION OF MAN.

SIR: In a letter in your issue of January 11, 1947, page 63, Professor Abbie, rebutting criticism of Professor Burkitt's paper on "The Zoological Position of Man", THE MEDICAL JOURNAL OF AUSTRALIA, November 2, 1946, says: "Aristotle, incidentally, does not constitute a 'majority of philosophers'; he denied that the brain produces thought because he believed that the heart did the job."

Aristotle's opinion should always receive respect, but on this matter, as Professor Abbie says, Aristotle was wrong, and not only wrong, but wrong despite contrary opinions of several other Greek philosophers.

Thus Plato, usually a staunch idealist, tells us (*Phaedo*, 96 AB) that Socrates asked: "Is it the brain which gives the senses of hearing and sight and smell and do memory and opinion come from these and knowledge from memory and opinion?"

Again, Alcmæon, of Crotona, early in the fifth century B.C., had held that sense-impressions are combined in the brain which receives them through avenues and constructs out of them memory and opinion and science; and the controlling centre, *τὸ ἡγεμονικόν*, resides in the brain.

So, too, believed Hippocrates and Democritus.

Yours, etc.,
GUY GRIFFITHS.

Sydney,
January 11, 1947.

PEPTIC ULCER.

SIR: Dr. Leo Doyle's thought-provoking essay on peptic ulcer (THE MEDICAL JOURNAL OF AUSTRALIA, January 11, 1947) interested me particularly in regard to his views on the treatment of hæmatemesis. I do not agree with his suggestion that all cases of hæmatemesis should be admitted to surgical wards. The aims of surgical treatment, as indicated by Dr. Doyle, are directed to replacement and hæmostasis; as a physician I hold that these aims can be achieved by gentler means. The ideal replacement of lost blood is unmodified blood given by direct transfusion, which also has an influence on the development of organizing thrombosis. I would like to stress that organizing thrombosis is a vital process associated with the active participation of platelets, leucocytes, tissue macrophages and fibroblasts. During the period of time in which this process is obliterating an eroded vessel, it may be necessary to give repeated direct blood transfusions.

I have given direct blood transfusions in 123 cases of hæmatemesis due to probable peptic ulcer. These patients had all experienced severe hæmorrhage and the average hæmoglobin was 40%; the average age was fifty-four years and the ratio of males to females was 2:1.

Ninety-two patients were given direct transfusion only and the average quantity of blood given was 900 cubic centimetres. In this group there were four deaths, none of which could be directly attributed to hæmorrhage. At autopsy in one case, a woman, aged fifty-six years, there was a gastric ulcer with an eroded artery, but there was no blood in stomach or intestine; histological section showed the lumen of the artery to be blocked by organizing thrombosis.

Of the remaining 31 cases, one patient was given serum and thirty patients were given citrated blood as well as direct transfusion. The average quantity of blood transfused was 3,500 cubic centimetres (1,800 cubic centimetres citrated blood and 1,700 cubic centimetres given by direct method). The patient who was given serum had improved after a direct transfusion, but collapsed and died suddenly after a litre of serum had been injected. In this group of thirty cases given both direct and indirect transfusions, there were three deaths; only one was due to hæmorrhage, and that was after an operation at which no ulcer was found.

In the total series of 123 cases, the general treatment was along medical lines and only three cases underwent operation.

In my opinion the successful management of a patient suffering from severe hæmatemesis depends to a great extent on skilled blood transfusion therapy, and I believe that the direct method should be used in preference to the usual drip transfusion of bank blood.

Yours, etc.,
JOHN A. McLEAN.

"Chelmer",
417, Saint Kilda Road,
Melbourne.
January 17, 1947.

Post-Graduate Work.

THE MELBOURNE PERMANENT POST-GRADUATE COMMITTEE.

Course on Radiation in Dermatology.

A COURSE of lectures on radiation in dermatology has been arranged by Dr. R. Kaye Scott, to commence on March 3, 1947. The series has been designed to meet the needs of the younger dermatological specialists who have been on active service. Dr. C. E. Eddy, Director of the Commonwealth Radium and X-Ray Laboratory, University of Melbourne, will give five lectures on the physical basis of dermatological radiation therapy. Dr. Kaye Scott will give the following clinical lectures: (i) "Radiation Biology and Radiosensitivity"; (ii) "Histological and Clinical Consideration of the Skin and the Effects of Radiation"; (iii) "Radium Plates"; (iv) "Technical Aspects of Gamma Ray Therapy in Dermatology"; (v) "X-Ray Therapy Techniques"; (vi) to

(ix) "Cutaneous Diseases". These lectures will be illustrated with four practical demonstrations by Dr. Ian Heinz, of the University of Melbourne Pathology Department.

Lectures will be given at the University of Melbourne Pathology Department for two weeks, from Monday to Friday, at 4.30 and 7.30 p.m., with an adjournment to the cafeteria for a meal. The fee for the course is £8 8s. Application for enrolments should be made to the Secretary of the Melbourne Permanent Post-Graduate Committee, College of Surgeons, Spring Street, C.1 (telephone JM 1547). Those entitled to Commonwealth Reconstruction Training Scheme assistance are requested to indicate this on their application.

Obituary.

STEWART OSBURN COWEN.

WE are indebted to Dr. W. A. Hailes for the following appreciation of the late Dr. Stewart Osburn Cowen.

Dr. Stewart Osburn Cowen died in Melbourne on November 29, 1946; he had been in indifferent health for some months and had gradually but progressively curtailed his activities. Born in 1893, his early years were spent in the country, in the north of Victoria, where his father, Dr. H. O. Cowen, practised. The family subsequently moved to Melbourne, and during his school and university days Dr. Cowen lived in Kew; he was educated at Melbourne Grammar School, where the foundation of a very liberal education was laid.

After he had passed, at an early age, the junior public examination which was then in vogue, his father told him he could devote one more year to preparation for the university course he intended to pursue and two years to acquiring the basis of a sound education; in the latter period he undertook the study of English and history; this he never regretted, and frequently referred in eulogistic terms to the foresight of his father who determined it. It was a pleasure to attend a clinic or a lecture delivered by him; he was a fluent and lucid speaker and a facile writer; the manner of both was delightful.

Stewart Cowen entered the University of Melbourne and Trinity College in 1911. He maintained the high academic standard he had achieved at school and set the seal on that record in the final year when he was placed first in all the main subjects, namely, medicine, surgery, obstetrics and gynæcology. He was awarded the exhibition in all three subjects and in addition the Jamieson Prize in Clinical Medicine; this is a distinction only achieved on four occasions in Melbourne, and it is noteworthy that in Cowen's case his course was interrupted by a period of service in the ranks in the Australian Army Medical Corps in the first Australian Imperial Force.

He enlisted in 1914 and saw service in Egypt and Gallipoli in Number 1 Casualty Clearing Station and was later returned to Australia to complete his medical course with the achievement noted above. A period of twelve months as a resident medical officer at the Royal Melbourne Hospital followed; then he reenlisted as a medical officer and rejoined the Australian Imperial Force in France, where he served with marked ability till the Armistice.

At school and at the university he played football and tennis, representing his school at football and Trinity College at tennis. In later years he continued to play tennis, but gradually devoted more of his leisure to golf and fishing.

On his return to Melbourne in 1919 he commenced practice as a physician and soon became established as a promising young consultant. Appointed physician to out-patients at the Royal Melbourne Hospital in 1923, he become recognized as one of its outstanding teachers of medicine.

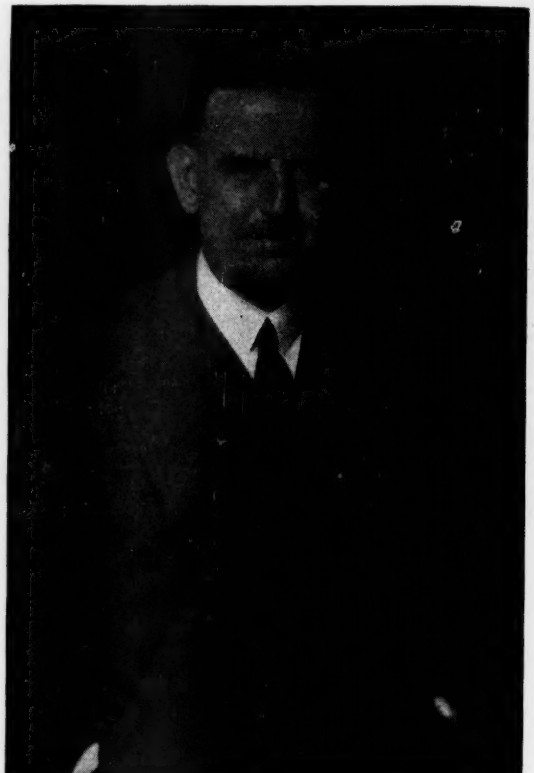
In 1928 he succeeded to an in-patient appointment. In the relative peace and quiet of ward work compared with an out-patient department his ability as a teacher, clinician and exponent of English as she is spoken had full reign, and until he left hospital in 1945 his clinic was most popular with students, graduates and residents.

The appointment of Stewart Lecturer in Medicine at the University of Melbourne followed in 1937 and was held till the middle of the war period when he relinquished office. When the Royal Australasian College of Physicians was founded in March, 1938, he was the first censor-in-chief, and in this position founded and developed the examination system at present in operation for admission to the College. He was at the time of his death its senior vice-president. Dr. Cowen had many outside interests; he took a prominent place in the cultural life of the city; art, music and the stage were equally attractive to him; indeed it was difficult to imagine where he found time for all. He had the most kindly feelings for his fellows in all walks of life, had quite the "common touch", and was just as popular with country folk as with his Melbourne friends.

In more recent years he spent his holidays in the mountain country of the north-east and east of Victoria; he was attracted greatly to these areas and to the people there.

The Medical School in Melbourne has lost at an early age one of its brilliant students and foremost physicians, one who played an outstanding part in the education of many students and house physicians and always contributed his share in the interests of post-graduate education.

In 1939 Dr. Cowen offered for service overseas; in view of his numerous teaching appointments in both under-graduate and post-graduate spheres in medicine, it was decided that it was unwise to interrupt these activities. Dr. Cowen then served on the Medical Directorate at Victoria Barracks and at 115 Military Hospital at Heidelberg during the war years.



His friends in all spheres of life, and they are very numerous, deplore his early passing and extend to his widow and three daughters their most sincere sympathy.

Dr. Reginald Webster writes: With the untimely passing of Stewart Osburn Cowen, one is left with the feeling that a light has been extinguished. His death terminates for me a literally lifelong association and friendship, for we were boys together in the mining township of Eaglehawk, Victoria, where his father, the late Dr. H. Osburn Cowen, was engaged in practice for some years before he moved to the practice in Kew, with which he was identified until his retirement from active medical work. Stewart worthily maintained the high professional standing and culture for which his father was distinguished.

As Stewart Cowen was several years my junior, our paths diverged through school and university, but coincided after his return from active service in the world war of 1914-1918. It was then that we worked at neighbouring benches in the laboratory of the Children's Hospital, Melbourne, for a period of eighteen months, Stewart having accepted a part-time appointment in the Pathological Department. This period was for me one of happy and stimulating association.

At this time also Stewart Cowen was the holder of the Clinical Research Scholarship, tenable at the Melbourne Hospital and the Walter and Eliza Hall Institute of

Research. The work he undertook as clinical research scholar was eventually embodied in a thesis on familial hæmolytic splenomegaly, which he presented in abstract at a memorable meeting of the Victorian Branch of the British Medical Association on October 4, 1922. Much of the work was done in the Children's Hospital laboratory, and Stewart Cowen pursued it with the clinical insight and assiduity which his subsequent career showed to be native to him. To this day his paper remains authoritative on the subject of familial hæmolytic splenomegaly, perhaps better known to most as acholuric family jaundice, and also to this day a descendant candidate for splenectomy of one or other of the families which he investigated is likely to appear at the Children's Hospital, Melbourne.

Stewart Cowen advanced rapidly as a consulting physician, and of late years my contacts with him have been less than of yore, having consisted mainly in collaborating with him in the annual examinations in clinical pathology. He was a gifted and lucid speaker, and in presence and clinical acumen of the very pattern of a consulting physician.

The decline in his health which became evident of recent months was a source of great distress to his friends, and now the Stewart Lectureship in Medicine, the Council of the Royal Australasian College of Physicians, the clinical school of the Royal Melbourne Hospital and the many younger physicians to whom he was a source of inspiration and strength will know Stewart Osburn Cowen in the flesh no more. Vale!

Dr. H. F. Maudsley writes: Perhaps I may claim to be one of Stewart Cowen's oldest friends. We were at Melbourne Grammar School and in Trinity together, and he was one of the band of boys, during Mr. Blanch's headmastership of the school, who have in after life become famous leaders in all branches of professional, diplomatic, political and civic life in Australia, and whose watchword has been one of service to the community.

The son of the late Dr. H. O. Cowen, his early life was spent at Eaglehawk, near Bendigo. The family later moved to Kew, where Dr. Cowen, senior, established a large suburban practice. Young Cowen was thus brought up in a medical atmosphere.

At the outbreak of the 1914-1918 war Cowen was finishing his fourth year medicine, but without hesitation immediately enlisted as a private in the Australian Army Medical Corps, went abroad and served in the casualty clearing station under Sir Henry Newland, being promoted to staff sergeant. He was later sent back to Australia to finish his course, which he did with utmost brilliance. He reenlisted, this time as a captain in the Australian Army Medical Corps, and served in field units in France. Our paths occasionally crossed in the mud and slush of Flanders, always with considerable pleasure to me, as Cowen had the art of radiating enjoyment.

Soon after the war Cowen was appointed first as clinical assistant, then as honorary out-patient physician, and at very early age in-patient physician to the Royal Melbourne Hospital, and it was during this early period that his great talents as a clinical teacher began to take shape, which led to his appointment as Stewart Lecturer in Medicine. During the time that Cowen was establishing himself as a clinician and teacher, and at the same time building up a large consulting practice, he never forsook the art of living and enjoying life.

In the region of sport, as a younger man, he was a promising lawn tennis player with a beautiful forehand drive, as well as a stylist at golf, but he lacked the sustained interest in these games to become very proficient; as a lover of beauty and nature, his interests became more widely dispersed. The artistic side of his temperament found satisfaction in photography, his love of nature and outdoor life in holidays by a trout stream.

He was an expert dry-fly fisherman, and apt pupil of the late Dr. Carl Stephens, himself one of the finest fishermen in the land. Cowen enjoyed the bird and animal life, the trees and the bush, as much as he did striking and landing a sizeable trout. He appreciated good food and good wine, and had an excellent knowledge of Australian wines—above all he was good company whether dining or sitting by the fireside discussing professional or general subjects. His visits to other States were eagerly looked forward to by his many interstate friends, not only for his erudition in medical discussion, but for his general wisdom, cheerful company and geniality.

Cowen's wide interests were reflected in his broad outlook as a physician. He was never a pedantic teacher, and his aim was to show the undergraduate and post-graduate student that medicine was an art as well as a science.

In his more mature days Cowen's organizing ability became manifest in the work that he performed when the original Association of Physicians was merged into what is now the Royal Australasian College of Physicians. He became the first censor-in-chief, and it is sad that he did not live to become President of the College that he so faithfully served.

There is little need to enlarge on the work that he did during the recent war. He was disappointed at not being sent away, and worked unsparingly and unceasingly in both civilian and army capacity. Although he realized that his health was failing, it was not until near the end of hostilities that he allowed himself any rest.

Stewart Cowen's life has ended at a time when his talents would have been of the greatest use for many years to come. The profession and the community in general are the poorer for his departure. To his widow and family the deepest sympathy is extended.

Dr. C. H. Fitts writes: As one who was junior to Dr. Stewart Cowen in the profession, I should like to pay my tribute to his life and influence. I knew him first as an inspiring teacher to a large class of students in his out-patient clinic. Though he never paraded these qualities, I recall his grace and courtesy to the patients as clearly as I do his ability in clinical discourse. I never crossed his path again for ten years, and then it was but a casual meeting in the street. It was, however, the beginning of material help and encouragement which could only have been given by one who set his professional course by other bearings than those of selfishness and material gain.

He was a just but merciless critic of medical papers presented for his opinion. It was a measure of his worth that, though one was sore and humbled, one always went back for more. He had great insight, but without being morbid about his own faults and failings. It would not be his wish therefore that they should be ignored. It suffices to say that they were warm human failings which endeared him to his friends.

Not long before the war he travelled to America and for a few months worked in Boston. This was a very happy period in his life. I believe that in that city of culture and medical learning, he made a place for himself and earned the respect of physicians of world renown.

I cherish the memory of joining him on almost his last fishing holiday at a place dear to us both. To the teaching of the art of dry-fly fishing I found that he brought the ability and patience which belonged to his teaching of medicine. He loved the country and country people and they in turn loved him.

I was privileged to see much of him in the last two years of his life. During all that time he knew what lay before him, and was greatly helped by the understanding and devotion of his wife and daughters. The eleventh hour found him tranquil and fearless.

The same may be written of him as was written of Thomas Sydenham:

> Human life was to him a sacred, a divine, as well as a curious thing, and he seems to have possessed through life, in rare acuteness, that sense of the value of what was at stake, of the perilous material he had to work in, and that gentleness and compassion for his suffering fellow-men, without which no man—be his intellect ever so transcendent, his learning ever so vast, his industry ever so accurate and inappeasable—need hope to be a great physician.

JOHN FISHER WILLIAMS.

We regret to announce the death of Dr. John Fisher Williams, which occurred on January 3, 1947, at Melbourne.

ALFRED CAMPBELL.

We regret to announce the death of Dr. Alfred Campbell, which occurred on January 4, 1947, at Wells, Canberra.

WALTER MARIO BUTLER.

We regret to announce the death of Dr. Walter Mario Butler, which occurred on January 15, 1947, at North Balwyn, Victoria.

BERNARD TRAUGOTT ZWAR.

We regret to announce the death of Dr. Bernard Traugott Zwar, which occurred on January 16, 1947, at Melbourne.

Australian Medical Board Proceedings.

NEW SOUTH WALES.

THE undermentioned have been registered, pursuant to the provisions of the *Medical Practitioners Act*, 1938-1939, of New South Wales, as duly qualified medical practitioners:

Macintosh, Laurel Jean, M.B., B.S., 1946 (Univ. Sydney), Tweed District Hospital, Murwillumbah.

McReady, Philip Archibald, M.B., B.S., 1946 (Univ. Sydney), Royal North Shore Hospital, St. Leonards.

Makinson, Jill, M.B., B.S., 1946 (Univ. Sydney), 45, Abbotsford Road, Homebush.

Messent, Derrick Orry Hunt, M.B., 1946 (Univ. Sydney), Western Suburbs Hospital, Croydon.

Murphy, Warren Ashton, M.B., B.S., 1946 (Univ. Sydney), Sydney Hospital, Sydney.

Murray, John Leslie Moreton, M.B., B.S., 1946 (Univ. Sydney), Mater Misericordiæ Hospital, Waratah.

Nagy, Gabriel Stephen, M.B., B.S., 1946 (Univ. Sydney), Sydney Hospital, Sydney.

Needham, Robert Frederic Howe, M.B., 1946 (Univ. Sydney), Royal North Shore Hospital, St. Leonards.

Nevell, Thomas Franklin, M.B., 1946 (Univ. Sydney), Hornsby District Hospital, Hornsby.

Nominations and Elections.

THE undermentioned have applied for election as members of the New South Wales Branch of the British Medical Association:

O'Donnell, Thomas Henry, M.B., B.S., 1942 (Univ. Sydney), 7, Kingsland Road, Strathfield.

Fisher, Bernard, approved for registration in terms of Section 17 (B) of the *Medical Practitioners Act*, 1938, on January 2, 1947, 183, Macquarie Street, Sydney.

Aird, Elizabeth, provisional registration, 1946 (Univ. Sydney), 10, Stewart Street, Eastwood.

Hannam, William Henry, M.B., 1946 (Univ. Sydney), Main Street, Lithgow.

Medical Appointments.

Dr. P. G. D. Prentice has been appointed acting visiting medical officer, Eventide, Sandgate, Queensland, in pursuance of the provisions of *The Charitable Institutions Management Act of* 1885.

Dr. J. E. Clarke has been appointed a member of the Police Medical Board in accordance with Section 7 of the *Police Regulation Act*, 1928, of Victoria.

Dr. R. G. Fox has been appointed public vaccinator, Department of Health, Victoria.

Dr. J. B. Cleland has been appointed acting honorary pathologist of the Royal Adelaide Hospital, Adelaide.

Dr. D. K. Caust, Dr. J. N. Diggle, Dr. H. J. Ellis, Dr. R. A. Kenihan, Dr. T. G. Maddison and Dr. J. H. Slade have been appointed resident medical officers, Royal Adelaide Hospital, Adelaide.

Dr. R. D. Hammill has been appointed honorary medical officer to the Port Pirie Hospital, South Australia.

Dr. H. E. H. Ferguson has been appointed a member of the Dental Board of Western Australia under the provisions of the *Dentists Act*, 1939, of Western Australia.

Books Received.

"A Textbook of Gynecology", by Arthur Hale Curtis, M.D.; Fifth Edition; 1946. Philadelphia and London: W. B. Saunders Company; Melbourne: Ramsay (Surgical) Proprietary Limited. 9½" x 6¾", pp. 772, with many illustrations. Price: 60s.

"The Management of Fractures, Dislocations, and Sprains", by John Albert Key, B.S., M.D., and H. Earle Conwell, M.D., F.A.C.S.; Fourth Edition; 1946. St. Louis: The C. V. Mosby Company; Melbourne: Ramsay (Surgical) Proprietary Limited. 10" x 6", pp. 1322, with many illustrations. Price: 94s.

"Diabetes: A Concise Presentation", by Henry J. John, M.A., M.D., F.A.C.P.; 1946. St. Louis: The C. V. Mosby Company, Melbourne: Ramsay (Surgical) Proprietary Limited. 8¼" x 5¼", pp. 300, with illustrations. Price: 24s. 6d.

"Directory of Social Service Agencies, Sydney", published by the Council of Social Service of New South Wales, Sydney; 1946. 8¼" x 5¼", pp. 220.

"An Introduction to Bacteriological Chemistry", by C. G. Anderson, Ph.D. (Birmingham), Dip.Bact. (London); Second Edition; 1946. Edinburgh: E. and S. Livingstone Limited. 7¼" x 4¾", pp. 510. Price: 20s.

Diary for the Month.

FEB. 4.—New South Wales Branch, B.M.A.: Organization and Science Committee. Special Groups Committee.
FEB. 5.—Victorian Branch, B.M.A.: Branch Meeting.
FEB. 5.—Western Australian Branch, B.M.A.: Council Meeting.
FEB. 7.—Queensland Branch, B.M.A.: Branch Meeting.
FEB. 8.—Tasmanian Branch, B.M.A.: Annual Meeting.
FEB. 11.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
FEB. 14.—Queensland Branch, B.M.A.: Council Meeting.
FEB. 17.—Victorian Branch, B.M.A.: Finance Meeting.
FEB. 18.—New South Wales Branch, B.M.A.: Medical Politics Committee.
FEB. 20.—Victorian Branch, B.M.A.: Executive Meeting.
FEB. 25.—New South Wales Branch, B.M.A.: Ethics Committee.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Honorary Secretary, 135, Macquarie Street, Sydney): Australian Natives' Association; Ashfield and District United Friendly Societies' Dispensary; Balmain United Friendly Societies' Dispensary; Leichhardt and Petersham United Friendly Societies' Dispensary; Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney; North Sydney Friendly Societies' Dispensary Limited; People's Prudential Assurance Company Limited; Phœnix Mutual Provident Society.

Victorian Branch (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federated Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

Queensland Branch (Honorary Secretary, B.M.A. House, 225, Wickham Terrace, Brisbane, B.17): Brisbane Associated Friendly Societies' Medical Institute; Bundaberg Medical Institute. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 178, North Terrace, Adelaide): All Lodge appointments in South Australia; all Contract Practice appointments in South Australia.

Western Australian Branch (Honorary Secretary, 205, Saint George's Terrace, Perth): Wiluna Hospital; all Contract Practice appointments in Western Australia. All government appointments with the exception of those of the Department of Public Health.

Editorial Notices.

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